ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 15, No. 25. WEEKLY.

NEW YORK, SATURDAY, FEBRUARY 15, 1890.

$3 per annum. Single Copies, 10 Cents.

Copyright, 1890, by ELECTRICAL REVIEW PUBLISHING COMPANY, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

TO THE CITY OF KANSAS.

Electrical Workers of the East Fill a Special Train on the Pennsylvania Road and Start for the Electric Light Convention at Kansas City, Mo.

THE NAMES OF THE TRAVELERS AND DESCRIPTION OF THE "ELECTRIC LIMITED" TRAIN.

The train that left Jersey City Sunday morning, February 9th, bound for the Convention of the Electric Light men, at Kansas City, Mo., reflected great credit upon the Pennsylvania Railroad Company and the Pullman Palace Car Company. The time for leaving was 10.25 A.M., following the Chicago Limited, and by that hour the delegates for the Convention, many accompanied by their wives, were safely and comfortably located in staterooms and sections in the palace cars "Scotland," "Belgium" and "Japan." In addition to these were the observation car "Olympic," the composite car "Raleigh," and the very important dining car "Continental." It was expected that at Chicago the additional cars "Phocion" and "Ilion" would be attached to the train for the purpose of accommodating the Chicago delegation.

Among the passengers who got on at Jersey City were, W. L. Candee and wife, E. H. Johnson and wife, A. H. Patterson and wife, W. J. Johnson and wife, P. H. Alexander, Dr. Amory, S. A. Barton, C. O. Baker, Jr., and wife, C. H. Benton, T. H. Brady, Capt. Brophy, H. J. Conant, E. F. Peck, M. J. Francisco, A. V. Garratt, J. W. Godfrey, M. W. Garver, M. H. Hartwell, E. B. Hatch, J. F. Kelley, H. W. Leonard, Dr. A. F. Mason and wife, Geo. T. Manson, A. D. Newton, C. E. Newton, Chas. W. Price, of the ELECTRICAL REVIEW; Geo. F. Porter, Geo. M. Phelps, of the *Electrical Engineer;* M. J. Perry, Col. C. M. Ransom, of *Modern Light and Heat;* H. D. Stanley, C. A. Schieren, Jr., John A. Seely and wife, C. E. Stump, of the *Electrical World*, and wife, F. J. Sprague, B. R. Western, L. Stieringer.

The Electric Club had been crowded the evening before with the Boston delegation, who had come over to meet the Committee on Transportation and complete arrangements for berths and tickets. The party will be increased at Philadelphia, Pittsburgh and other cities along the line, and will spend Monday in Chicago as guests of the enterprising Electric Club of that city.

The train which is known as the "Electric Limited," will make but eight stops between Jersey City and Chicago, and these only to change engines, arriving in Kansas City early Tuesday morning.

Conductor Ege, of the Pullman Company, under whose care the Pan-American delegates traveled 60,000 miles, will attend to the comforts of the Convention tourists.

The ELECTRICAL REVIEW will contain a full report of the Convention in its next issue. The programme which has been arranged for is given below. It is expected that the Convention will be very largely attended, and it is to be hoped will adjourn in a condition much improved over that at Niagara Falls six months ago. We publish the programme below:

PROGRAMME OF THE KANSAS CITY CONVENTION.

Mayor Davenport will welcome the association and attending visitors to Kansas City.

President E. R. Weeks will open the Convention with a brief address.

Secretary and treasurer Allan V. Garratt will make the usual reports.

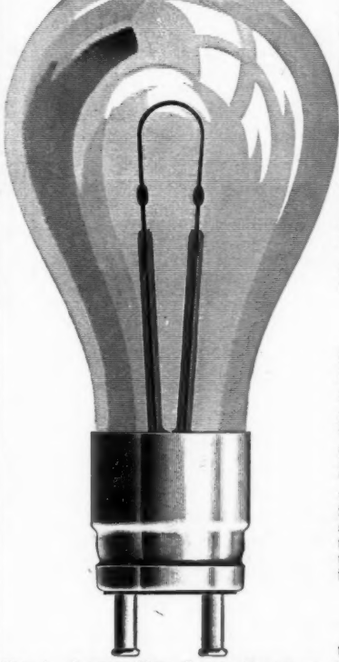


FIG. 1.—SAWYER-MAN SERIES INCANDESCENT LAMP. (Three-quarter size.)

PAPERS.

Prof. Elihu Thomson.—"Safety Devices in Electrical Installations."

Prof. Henry A. Rowland has consented to present a paper based upon a correspondence with the members of the association, carried on by the secretary, for the purpose of ascertaining with what technical questions connected with the art of electric lighting they find the greatest difficulty.

Mr. Thomas A. Edison will give an address by phonograph, which will reproduce Mr. Edison's voice loud enough to be heard in all parts of the house.

Mr. Frank J. Sprague.—"Electricity as Applied to Street Railways."

Mr. F. E. Sickels.—"The History and Theory of the Steam Engine."

Mr. George H. Babcock.—"The Economic Generation of Steam."

Mr. Myron D. Law.—"Nine Years with the Arc Lamp."

Mr. C. A. Harber.—"Line Insulation from the Standpoint of Practical Experience."

Mr. T. Carpenter Smith.—"A Universal System of Central Station Accounts."

Mr. A. J. De Camp.—"The Cost of the Products of Central Stations."

Mr. C. J. H. Woodberry.—"Central Station Construction."

Mr. C. J. Field.—"A Recent Edison Central Station and the Results Thus Far Obtained."

Mr. Henry W. Pope.—"How Our Paths May Be Paths of Peace."

Mr. C. C. Haskins.—"Prodigality in Economy."

Mr. E. F. Peck, in the discussion of Mr. M. L. Law's paper, will give the results of his numerous tests of arc light carbons.

REPORTS WILL BE MADE BY

The Executive Committee, Mr. G. W. Hart, chairman.

Committee on Patent Legislation, Mr. Arthur Steuart, chairman.

Committee on Underground Conduits and Conductors, Mr. E. T. Lynch, Jr., chairman.

Committee on Harmonizing Electric Light and Insurance Interests, Mr. P. H. Alexander, chairman,

Committee to Confer with Mayor Grant in regard to the International Exposition of 1892, Dr. Otto A. Moses, chairman.

Committee on Electrical Data, Mr. A. R. Foote, chairman.

Committee to Memorialize Congress on the Abolition of Custom Duty on Copper, Mr. C. A. Brown, chairman.

Committee on Electrical Execution, Mr. E. W. Maher, chairman.

Committee on Standardization of Potential on Electric Street Railways, Mr. E. T. Lynch, Jr., chairman.

National Committee on State and Municipal Legislation, Mr. A. R. Foote, chairman.

The Toads and the Electric Light.

A lady tells how she was recently waiting in a carriage near an electric lamp which had just been lighted, while her friend went to a neighboring shop. In the dry road she presently saw a stir, and, looking over the wheels, saw, hopping in all directions across and around, toads aiming for the light. She got out and aimed for the lamp, too. There was a ring of toads underneath it already, waiting for the fall of moths and the insects of night that drop from the life-destroying flame. It was a curious sight—those creatures squatted in a circle, with upturned heads, waiting for the victims to drop into their mouths.

A Publication of Great Interest.

Our readers will notice in another column the announcement of the ELECTRICAL REVIEW. In these days of progress a paper or periodical bearing upon electrical matters is

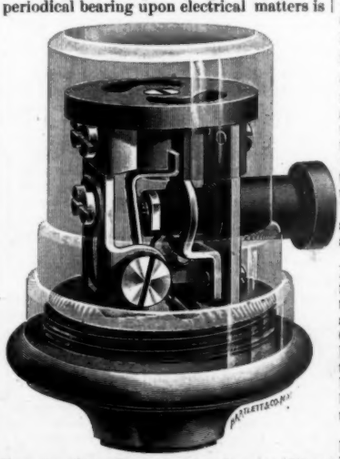


FIG. 2.—SOCKET OF THE SAWYER-MAN SERIES INCANDESCENT LAMP.

of importance to every person who desires to be abreast of the times. The ELECTRICAL REVIEW is a leader in its class, and it is a publication of great interest to the general reader as well as to the specialist.—*Free Press, Great Falls, N. H.*

The Sawyer-Man Electric Company.

FACTS AND FIGURES REGARDING THE MANUFACTURE OF INCANDESCENT LAMPS.

It has been noted within the last few years that, with the increasing demand in all branches of electrical industry, the tendency among producers has been toward consolidation. Instances are of too recent occurrence to need mention. The company whose name forms the title of this article needs no introduction to the readers of the ELECTRICAL REVIEW, but certain interesting facts regarding its formation and growth will be acceptable and instructive.

In September, 1886, the Sawyer-Man Electric Company was organized for the purpose of carrying on the business of manufacturing and selling lamps and electrical supplies under the patents of Sawyer and Man. These patents were the property of the Consolidated Electric Company, of which the Sawyer-Man Company became the licensees and commercial agents under this agreement. In October, 1888, both the Consolidated Electric Company and the Sawyer-Man Electric Company were leased by the Westinghouse Electric Company, of Pittsburgh. About this time the Westinghouse Company also became the lessees of the United States Electric Company. Under the new *regime* the entire lamp and electrical supply business of both the Westinghouse Company and the United States Company was placed in the hands of the Sawyer-Man Company, in addition to its own former trade.

Until January 1st, 1889, all the above named companies had been doing a general electrical business; installing plants and manufacturing machinery, lamps and supplies. At this time, however, a mutual agreement was entered into by which the Westinghouse Electric Company was to manufacture and sell all the apparatus for central station lighting, the United States Electric Company was to manufacture and sell all apparatus for isolated plants, and the Sawyer-Man Electric Company was to manufacture and sell all lamps, sockets, cut-outs and general supplies, to all the customers of the other two companies, besides supplying all the outside trade possible. To facilitate the accomplishment of the proposed arrangement, all the pumps and other machinery were removed from the Pittsburgh factory to the present factory on Twenty-third street, this city. The old lamp factory of the United States Company, at Newark, N.J., is always in reserve in case of fire or accident at the New York factory.

At the organization of the Sawyer-Man Electric Company, in 1886, the lamp manufactory was in Brooklyn, and the offices of the company were in the Mutual Life Insurance Building, 32 Nassau st., New York City. On December 13, 1887, the Brooklyn building was destroyed by fire. A short time previous to this disaster, the present building had been negotiated for, it having been intended to run it in connection with the Brooklyn factory.

For a brief period after the fire, the Pittsburgh company had to be depended on to fill lamp orders, but by excellent management and a great deal of push, the Twenty-third street factory was able to turn out lamps in March, 1888. It was of prime necessity that the New York building be got into shape as soon as possible, as the Pittsburgh company were already cramped for room and overtaxed with orders. The offices of the Sawyer-Man Company were moved from

Nassau street to the present quarters in Twenty-third street, on May 1st, 1888.

The buildings at present occupied by the company for offices and factory are situated on West Twenty-third street, this city, and cover 13 city lots. The street numbers run from 510 to 534 inclusive, and covers a frontage of 325 feet. The structures include the factories proper, a laboratory building, boiler house and offices. An addition to the boiler house is in process of erection and when the new battery of boilers is in place, 1,350 horse-power will be available to drive the engines, dynamos and pumps. The cut (page 6) gives an idea of the general external appearance of the plant.

As an evidence of the successful growth of the company, it may be said that at its formation in 1886, the total office and working force numbered 46. To-day this number has reached a total of 454. The lamp production will also give an idea of the increase in the demand for the Sawyer-Man lamps. The figures follow:

LAMP OUTPUT—SAWYER-MAN ELECTRIC COMPANY.

1886, September (initial month)	4,000
1887, "	22,000
1888, "	39,000
1889, "	176,000
1890, January	225,000

Such figures need no explanation. They speak for themselves.

A representative of the ELECTRICAL REVIEW recently had the privilege of a trip through the lamp manufactory, with the genial acting superintendent, Mr. J. W. Packard, as cicerone. It was an occasion as gratifying as it was instructive, and it is with great pleasure that the REVIEW herewith records his observations.

The first we see of the glass bulb which forms the lamp is when it comes to the factory from the glass-blower. The neck is considerably longer than in the finished lamp, but other than this, its appearance is the same. After a careful examination for cracks and flaws, the bulb is thoroughly washed and dried. From the drying rack it passes to a glass-blower who "tubulates" it; that is, a tube of glass of small diameter, and about four inches long is fused to the larger end of the bulb. This is done simply to facilitate the handling of the bulb. We next pass to another table in the lamp room where the "mounts" are being made. The "mount" is formed of two little glass beads of fine bore and about five-eighths of an inch long.

These little beads are placed outside of two platinum stems, and grasped in a pair of pincers. They are then held in a gas flame, separated at an angle of about 30 degrees, and fused together. Before the platinum stems are placed in the beads they are slightly heated, in order to drive off any foreign substance or coating of air which may adhere to them. In the upper end of these platinum wires a little hole is bored to receive the carbon filaments. The platinum used in these stems is obtained from Siberian mines, most of which are controlled by an English-American syndicate. The platinum in a lamp forms a considerable item in the cost, the Sawyer-Man Company having used about $12,000 worth during the past month. The market price of platinum varies between $8.50 and $12 per pound, sometimes rising even higher. Placing the stems inside these glass beads is a distinct feature of this lamp.

Next comes the sealing or making of the lamp. This consists simply in placing a mount containing a filament inside of a bulb. The bulb is then fused around the mount and passed along to the pump room. Before being placed in the pump, the base of the lamp is smoked to prevent too sudden cooling after the melting in of the mount. Most of the operations mentioned thus far may be seen illustrated in the cut which we present of the lamp room.

We now enter the pump room, which occupies the whole of one floor. The pumps used here are of the improved automatic Geissler pattern. About 10 tons of mercury are used in the pumps. By an ingenious arrangement of automatic valves and signals, shown in our cut, an immense saving of labor is effected, so that one man can take care of the pumps acting on 190 lamps. About four and one-half hours are necessary to completely exhaust the air from a bulb, and, as the present capacity of the pump room is 40,000 lamps, it will be seen that about 9,000 lamps per day are turned out here.

The lamp is now taken to a dark room, where a photometer test, to accurately determine the voltage, is made. Next comes the finishing, cleaning and cementing on the base. Now the lamp undergoes a second test of some duration to discover any defects which may develop. The lamps are then sent to the stock room, and are tested a third time before shipping.

It now only remains to describe the making of the carbon filament. The base is a fine silk thread which is first chemically treated. Then it is submitted to a process of carbonization, after which it undergoes a hydro-carbon treatment. Next the filament is set in the stems in the glass mount and the joints electro-plated. Then it is sent back to the glass-blowing room where it is sealed in the lamp. The hydro-carbon treatment is said to double the toughness and life of the filament.

Figs. 1 and 2 show the new series incandescent lamp for arc circuits. Fig. 1 is three-quarters size, and Fig. 3 shows the socket in full. These advantages are claimed for the new lamp: In case of the failure of the lamp, from any cause, the circuit is instantly closed by means of a fusible plug contained in the thumb piece shown in the cut. If either the lamp or the thumb piece is removed, the socket is so constructed that it automatically closes the circuit. All conducting parts are made sufficiently heavy to prevent any danger of overheating. All other parts of the socket, including the shell, are made of non-conducting material, which thoroughly insulates the current and secures perfect safety.

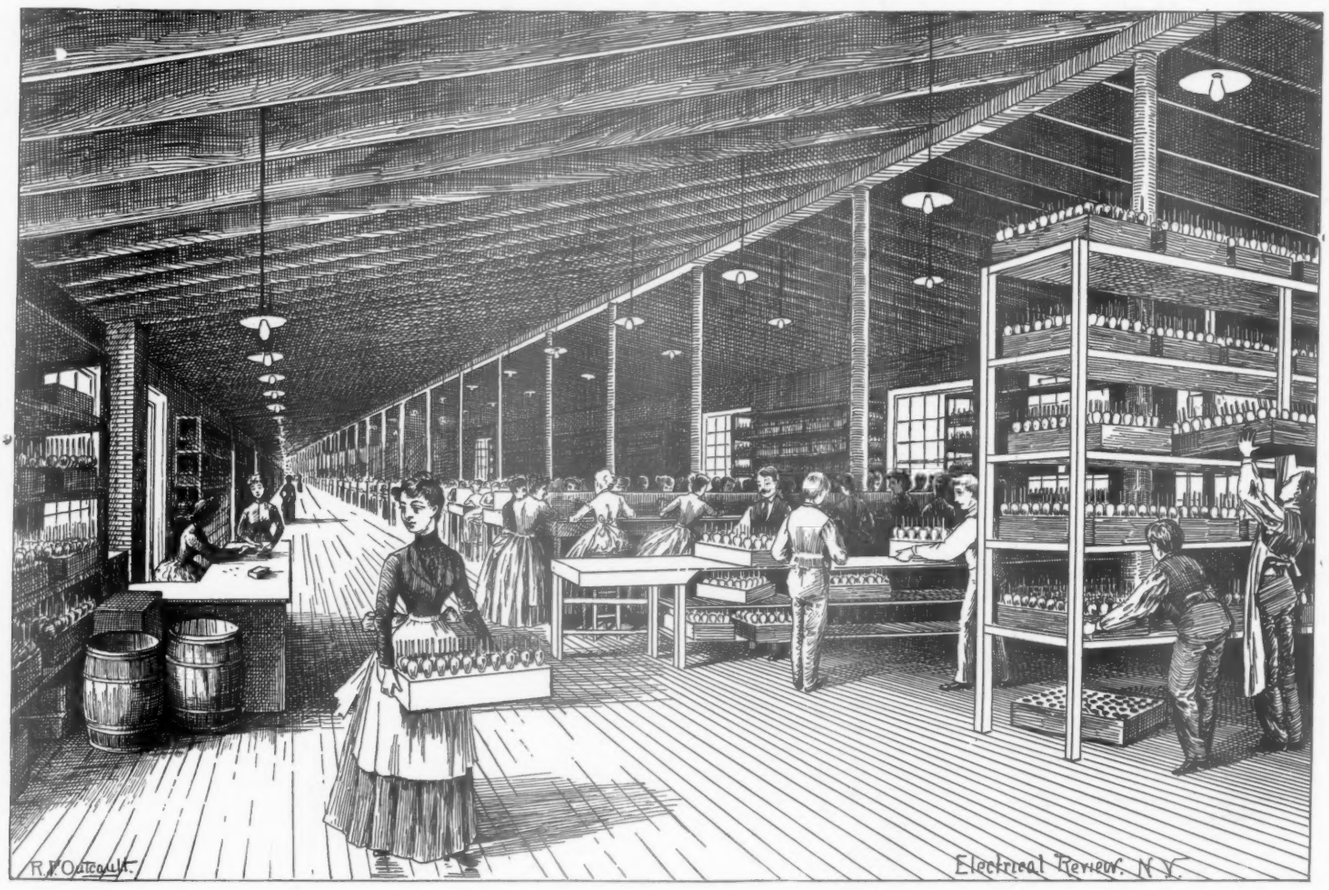


FIG. 3.—LAMP ROOM, SAWYER-MAN LAMP FACTORY.

The present officers of the company are as follows: George Westinghouse, Jr., president; H. M. Byllesby, vice-president; P. H. Alexander, general manager; C. H. Barney, treasurer; J. E. Coggeshall, auditor.

An Electric Locomotive and Train.

It is proposed by the Woodward Electrical Company, of Detroit, to run a train by means of storage batteries from that city to Kansas City. The train will consist of an electric locomotive and two cars. The motor car will resemble an ordinary cable grip-car more than anything else.

This train will stop only at Chicago and Quincy, as is thus far known. In these two cities the cars will be transferred from the railroad tracks to the street car tracks, as the gauge is adjustable to any width, from the broadest railroad gauge to the narrowest country hamlet bob-tail street car track. Exhibitions will be given in the two cities named. The train will be tried on the several cable tracks, and the citizens given an opportunity to see something that will astonish them more than the cable system did four years ago. These special cars will be handsomely fitted up with reference to both ease, portability and convenience. They will be much lighter than the ordinary day or sleeping car and smaller in every way. Berths will be fitted up that will be as comfortable to repose upon as those of the most luxurious Pullman or Mann boudoir palace. The cars will be stocked with a handsome outlay of provisions, so that the train may be said to have its dining car with it all the time. When it is found necessary to re-stock with motive power, the train will stop at a town where there is an electric light station and re-charge its storage batteries.

If the trip is successful, this train, with its adjustable gauge, ought to be able to bowl right up to the doors of the convention. "Look out for the Electrical Locomotive!"

The Electric Lighting Situation in New York City.

A very large proportion of the street lighting is done by the now combined United States and Brush Companies. The few down-town lights now burning, that are not run by private plants, are operated by these companies. When Mr. Paul D. Cravath, the attorney who represents both companies, was asked what the plans were for the resumption of business, he said:

"It had always been the plan of the people who organized the United Electric Light and Power Company, who now control the United States and Brush Companies, to, as soon as possible, do all their work by means of underground conductors. It was their intention only to use the overhead system of the United States and Brush Companies pending the building of sufficient subways to accommodate their business. The companies themselves had no control over the building of subways, as the right to build them had been vested by the Board of Electrical Control in the Consolidated Telegraph and Electrical Subway Company. Unfortunately, when the attack upon the poles and wires of these companies was made by the Commissioner of Public Works, comparatively few of the subways had been completed. The result was that the sudden crippling of our overhead system compelled an interruption in the service until the business could be resumed through the subways or new overhead facilities could be afforded. As there seemed to be no chance of the Board of Electrical Control giving further privileges of overhead lines, even to the extent of allowing the shattered system of lines left to be repaired for temporary use, and as the companies themselves had no desire to perpetuate the overhead system, the plan was adopted of pushing the work of getting into the subways without attempting any extensive rehabilitation of the overhead system. This work is necessarily slow, owing to several facts:

"First.—Information necessary for the ordering of cables could not be obtained until the completion of the subways in their different localities, so that there was considerable necessary delay in the ordering of the cables. The capacity of the factories

which supply proper electric light cables is limited, and while they have all been running to their fullest capacity and sending the greater part of their out-put to this city, it will be some time before they can catch up with the demand.

"Second.—On the delivery of such cables as manufactured, the work of placing them in the conduits and preparing them for use is necessarily very slow.

"Third.—After the cables are laid an underground connection must be made with each customer by a cable connection. This work is rather complicated and requires skilled hands, so that with the utmost diligence it will require considerable time. All things considered, remarkable progress has been made.

"The United States Company has restored almost its entire incandescent service and a considerable portion of its arc service. The Brush Company, however, has not been able to do this, owing to the fact that its station is some distance from the nearest subway, so that it cannot utilize the subways until the connecting subway, now in process of construction, is finished. It is the expectation that most of the lights along the line of the present subways will be burning within 60 days, and many of them, of course, much sooner.

"As to the portions of the city where there are now no subways, the companies will have to wait until warm weather comes. It is expected that most of the parts of the city which have heretofore been lighted by electricity, and many other streets besides, will by next fall be provided with both arc and incandescent lights operated through the subways."

"Why is it that so few of the city lights have been relighted?"

"Not because, as some suppose, the companies through a feeling of unfriendliness have refused to do so, but because very few of them can be connected with the companies' stations, either by overhead wires or through the subways. The companies are just as anxious as the city to restore the city lighting at the earliest possible date."

"What precautions have your companies taken to make their business safe?"

"Our companies use the Westinghouse converter system exclusively for incandescent lighting, and the present plan is to extend the same system to arc lighting, under improvements recently made. It has always been our contention that the converter system, where the street mains are placed in well-constructed subways, affords the safest system of electric illumination, or, for that matter, the safest system of illumination of any kind, which has been devised. While it is true this system involves the use of the high tension alternating current, this current is only found in the street mains, which are underground entirely out of reach, and where they can do no harm, while the converter or transformer converts the current into an entirely harmless current of only 50 volts before it reaches the consumer; so that the lamps operated by this current, whether arc or incandescent, can be handled with perfect impunity. The converter, indeed, is the greatest safeguard against the dangers of electric lighting which has ever been invented, as it furnishes an impossible barrier against danger from shock or fire beyond which the high tension currents in the street mains can under no circumstances pass. We have in operation in this city almost 20,000 incandescent lights on the converter system, and have never had a single accident by shock or fire, and there is no case on record where the Westinghouse converter, with thousands of them in use, has failed in the full performance of the important functions just described. We, therefore, feel certain that when this system has been developed and extended to both arc and incandescent lighting, as our companies propose, that our business will be made as safe as any business that is transacted in this city. And in saying this we are not merely theorizing, for our conclusions are supported by the experience of London and other European cities, where the converter system has come into almost universal use, to the exclusion of almost every other kind of electric light, and has been recognized as insuring absolute safety to the consumer of electric illumination."

In a recent issue of the New York *Sun* the following comments appear, on the local condition of affairs:

It is more than six weeks since the first blows of Commissioner Gilroy's axemen left the city dependent upon the moon and the stars as the chief source of street illumination after nightfall. The feeble attempt to rehabilitate dismantled lamp posts here and there has been a dismal failure in most cases. On cloudy, moonless nights, after the lights in stores and dwellings have been extinguished, many streets have been black as ink, and travel upon them has been positively dangerous. Everybody has regarded this condition of things as a matter of a few days at most. People have watched with a good deal of satisfaction the demolition of the poles and wires. But it was believed the companies would promptly restore the interrupted service on a safer basis. Just how they would be able to do this with permission to string wires overhead refused, and with only a few subways ready for use, nobody was able to say, but it was the popular impression that it would be done somehow.

But the time has come when most people want to know how much longer the present unsafe situation is to continue. Everybody agrees that electric street lighting has become a necessity, and that it is a serious matter to suspend it for any length of time. The solution of the present problem does not rest primarily with the lighting companies. They are availing themselves as rapidly as possible of such subways as are ready for use, but that is only the first and easiest step toward the solution of the problem. In the great majority of streets where there are no subways it will be a matter of many months before electric wires and lights will again be in use. The only public street electric lights now burning below Harlem are a few on Sixth avenue not far from Fourteenth street. Even in the streets where there are subways, the companies do not expect to get all their lights burning for about two months yet. The only streets which will then be lighted are Broadway, the Bowery, Third avenue, Houston, Fourteenth, Twenty-third, Twenty-ninth, Forty-second and Fifty-ninth streets, and Sixth avenue from Fourteenth to Fifty-ninth street. The rest of the city must wait until more subways can be built. The companies have practically abandoned the effort to maintain the overhead system."

Electrical Testing at Johns Hopkins University.

Prof. Henry A. Rowland, of the Johns Hopkins University, has devised several new electric dynamos which are now to be seen at work in the large dynamo room of the physical laboratory. The design is to obtain an efficient machine to produce a current in the most economical manner. It is believed these machines, which look very different from the ordinary dynamo, will be able to do so, and they are now being tested.

The bureau of electrical measurements has been engaged in making valuable experiments to test the efficiency of the converter's current. Before entering the converter has its strength and pressure measured in a meter and voltmeter in a large basin protected from the air by woolen coverings. The converter is immersed, being enclosed in a water-jacket. Thermometers measure the temperature and amount of water tha runs through the jacket. Thus it can b calculated how much of the current goes to waste in the converters. The amount of work the electric current is able to do after coming from the converter is also measured. It is estimated that between 10 and 12 per cent. of the current's strength is lost in the converter.

Chicago, Ill.—The Chicago Central Phonograph Company, at Chicago; to manufacture phonographs; capital stock, $200,000; incorporators, N. H. Judah, Fred. G. O'Connell, A. A. Bliss.

Bucksport, Me.—The Bucksport Electrical Company was organized at Bucksport last week, with the following officers: President, John Post, Jr.; vice president and general manager, F. S. Palmer; treasurer, Otis K. Smart. The plant will be of 1,000 incandescent light capacity.

Winston, N. C.—The Electric Light and Street Railway Company, of Winston, N. C., has been organized. The board of directors are, H. W. Fries, of Salem; W. A. Whitaker and J. L. Ludlow, of Winston; E. H. Johnston, J. H. McClement and F. J. Sprague, of New York, and E. L. Hawks. The officers are, president, F. J. Sprague; vice-president, E. L. Hawks; secretary and treasurer, J. H. McClement.

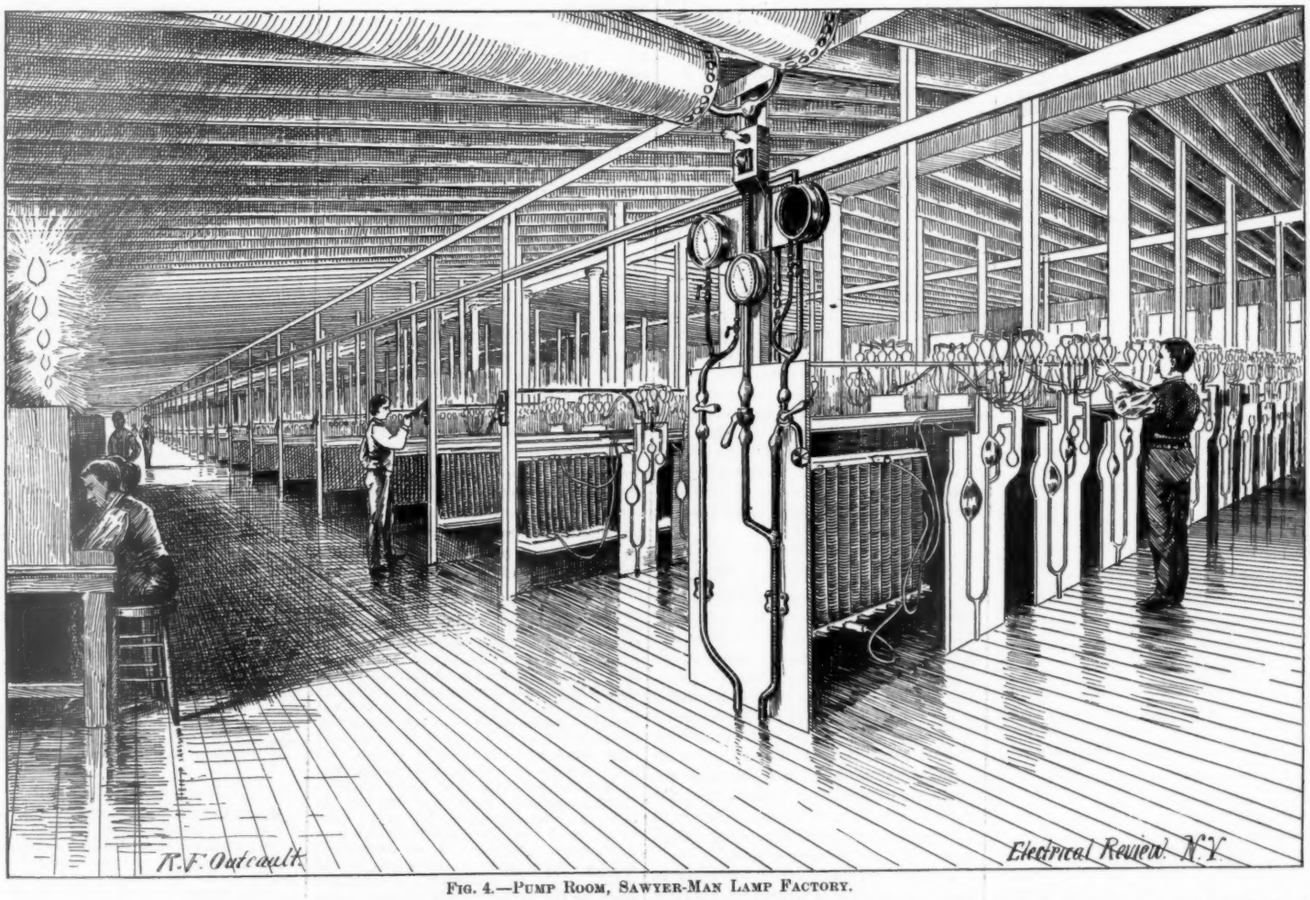


FIG. 4.—PUMP ROOM, SAWYER-MAN LAMP FACTORY.

Keokuk, Ia.—At a meeting of the city council an ordinance empowering the Keokuk Electric Street Railway and Power Company to construct an electric street railway was passed. The company was granted the exclusive right of way for a period of 20 years for operating a street railway over 27 of the leading thoroughfares of the city.

Colorado Springs, Col.—The Pacific Lowe Gas and Electric Company has filed a certificate of incorporation. The capital stock of the company is $3,000,000, divided into 30,000 shares of $100 and to be non assessable. The length of time is 20 years. The affairs and management of the company are to be under the control of five directors, Thaddeus S. C. Lowe, Joseph F. Humphrey, Lion P. Lowe, Edwin Greendyke and Cornelius F. Cronin.

ELECTRICAL REVIEW

Published at 13 Park Row
P. O. BOX 3329.

GEO. WORTHINGTON, - - Editor.
CHARLES W. PRICE, Associate Editor.
T. J. McTIGHE, Electrician and Manager Patent Bureau.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
"646 JOHN," TELEPHONE CALL.

BOSTON OFFICE:
STEPHEN L. COLES, 196 Summer St.

WASHINGTON OFFICE:
GEO. C. MAYNARD, 1419 New York Ave.

CHICAGO OFFICE:
D. B. DEAN, 61 Metropolitan Block.

EUROPEAN OFFICE:
CHARLES FFRENCH, Bridge House, 181 Queen Victoria St., London, E. C.

SUBSCRIPTION TO THE ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy. - - - - .10

ANNOUNCEMENT.

Address all communications and make all money orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

No attention will be paid to communications for the REVIEW without the *name and address of the writer.*

NEW YORK, FEB. 15, 1890.

CONTENTS.

PAGE.

To the City of Kansas ... 1
The Toads and the Electric Light ... 1
A Publication of Great Interest ... 1
The Sawyer-Man Electric Company ... 1
An Electric Locomotive and Train ... 2
The Electric Lighting Situation in New York City ... 2
Electrical Testing at Johns Hopkins University ... 3
New Corporations ... 3
Electric Traction Abroad ... 4
Telephone Conductors ... 4
Electricity and the Mariner's Compass ... 4
Correspondence:
Our Washington Letter ... 4
Our St. Louis Letter ... 4
Our Boston Letter ... 5
Our Chicago Letter ... 5
Changes in the Metropolitan Telephone and Telegraph Company ... 5
City Contract.—Electric Light ... 5
The Secretary of the Electric Light Association Necrologically Considered ... 5
In Honor of Mr. Madden ... 5
The Okonite Thermometer ... 5
Telephonic News ... 6
That Government Telephone Case ... 6
Col. Clowry Believes in Dynamos as Against Batteries ... 6
Our London Letter ... 6
Prof. Alexander Graham Bell Dined in Omaha ... 7
United Electric Company ... 7
Telegraphic ... 7
Erie Telephone and Telegraph Company ... 7
Electric Power ... 8
The Mather Electric Company Increasing its Facilities ... 8
Sprague Electric Snow Plow ... 8
Tests of an Interior Conduit ... 8
Letter to George William Curtis in Defence of the Electric Wires ... 8
Saving the Broken Lamps ... 8
Through Parlor Car Express to Atlantic City via Pennsylvania Railroad ... 8
The Sperry Electric Company ... 9
Doyle's Motor Switch ... 9
Electric Light News ... 9
New Work of the Eddy Motor Company ... 10
The "Plug" Operator ... 10
An Electrically-Fed Horse ... 10
Progress in the Supply Business.—The Central Electric Company, Chicago ... 11
The Trinidad-Heimann Insulated Wire Company ... 11
An Electric Car Episode ... 11
The Wimshurst Static Electrical Machine ... 11
A Question of Contract ... 11
More Electric Railways ... 11
Kindred Interests ... 12
A New District Call Box ... 12
Electrical Patents ... 12

No, Adolphus, electric lights are charged for by the lamp hour and not by the "current month."

The city at the mouth of the Kaw will see a fine-looking body of electrical men this week. There is life and push in the electrical workers, and this is what the enterprising and progressive West appreciates.

There is a valuable little work entitled "The A B C of Electricity," by W. H. Meadowcroft, which Mr. Geo. Wm. Curtis might read with profit. So could many other literary critics of electricity.

The annual report of Commander Bradford, of the Navy, on the lighting of government vessels, etc., has just been issued by the Bureau of Navigation. This report was published in the REVIEW of December 28th.

The Royal Society of England has resolved to raise a fund to establish a memorial of an international character, commemorative of the life-work of Joule.

Col. Thomas Ochiltree is pressing a bill before the House of Representatives authorizing the Postmaster-General to cause an investigation to be made forthwith as to the alleged advantages to the United States Government of entering upon an arrangement with the owners of the recently invented process of telegraphy, known as the multiple telegraph system of Lieut. F. Jarvis Patten. This is to be done with a view to its use in the government business, if it is found more economical to adopt it.

It is understood that the Boston Electric Club intends to issue in the near future a set of rules for the guidance of the public in general, and policemen and firemen in particular, in regard to handling wires which may, by accident, become crossed or fall into the public streets. The fact is demonstrated daily that, outside of the strictly professional ranks, the people are woefully ignorant in matters electrical. There is no doubt that many serious accidents might have been prevented had some cool person on the scene possessed even a rudimentary knowledge concerning wires charged with a current of electricity.

The rules should be as few and as simple as possible, and couched in untechnical terms. If this is done, we predict that they will do as much good as those issued by the Humane and Life-Saving Societies.

Electrical men generally, who have viewed with contempt the rabidly ignorant sensational matter referring to electricity, with which the daily press has bewildered and alarmed the newspaper reading public during the past few months, will cordially agree with the following passage extracted from an article by Mr. E. L. Godkin, on "Newspapers Here and Abroad," published in the February *North American Review:* "Go into a circle of scientific or cultivated men in any field, in America, or France, or Germany, or Italy, and you will have the mental food which the newspapers supply to the bulk of the population, treated with ridicule and contempt, the authority of a newspaper as a joke, and journalism used as a synonym for shallowness, ignorance and blundering." The amount of "shallowness, ignorance and blundering," with which most of the New York dailies treat electrical matters is positively colossal, as we have occasionally pointed out before.

ELECTRIC TRACTION ABROAD.

This branch of electrical engineering, which in the past few years has made such gigantic strides in this country, seems at last to be making a little headway amongst our conservative cousins across the herring-pond. The London *Electrician* recently published quite a respectable list of electric railroads, in operation and projected, in Great Britain. We now notice from the English electrical journals just to hand, that the horse car companies themselves are aiding in the good work by appealing to corporations owning systems of electric traction to come on and show them how the thing is done.

A surface railroad company operating in one of the suburbs of London, invites fresh tenders for the horsing of its cars for 12 months, and offers to guarantee payment for a minimum mileage of 250,000 to 300,000 miles. The company possesses full parliamentary powers to work by electricity and calls upon electric companies to come forward and carry out the service, giving guarantees for due performance under proper conditions, at a fair price.

It is estimated that, at the average cost of horse traction in London, this contract would be worth in the neighborhood of $40,000 a year, and consequently it well merits the attention of firms exploiting electric traction systems. Our British contemporaries look upon the proposals as a challenge to electric traction to show what it can do, and it is to be hoped for the sake of the industry, which is undoubtedly destined to be one of the most important applications of electricity, that it will meet with an eager and effective response.

TELEPHONE CONDUCTORS.

Sir William Thomson, in the course of an article on "Electric Lighting and Public Safety," published in the current issue of the *North American Review*, says that it may be considered as definitely resolved that the distribution of electric energy for light and power in towns of Great Britain, shall be by underground conductors, and that the post-office telegraph department has already replaced nearly all the aerial telegraph wires of the larger cities by underground conductors.

Sir William continues: "The telephone wires alone remain in the air, long may they hold their place there; they are perfectly harmless to the general public, and they are enormously less expensive where they are than they could be if placed underground."

American telephone engineers will heartily endorse this sentiment. It is next to impossible to make the general public understand the difficulty of operating the telephone through underground wires, between points more than a very few miles apart, and the hindrance to the development of long distance telephony due to the underground craze is enormous. As Mr. J. J. Carty very pertinently pointed out in his recent paper on telephone induction read before the Electric Club, "to place telephone wires underground and maintain the same efficiency as in overhead lines, would require an insulation of over two feet in thickness on each wire, and instead of getting 50 pairs of wires into a three-inch pipe, as at present, a tunnel occupying half the street would be required for one cable alone. When we consider that a telephone office of even moderate size would require 100 such gigantic cables, it is seen how almost hopeless the case becomes."

With Sir William Thomson, we fervently pray that the telephone wires may long retain their place in the air.

ELECTRICITY AND THE MARINER'S COMPASS.

Lieut. W. H. Schuetze, the superintendent of compasses of the U. S. Navy, notes several interesting facts in relation to magnetic and electric disturbances to which ships' compasses are subjected and the remedies therefor. He is led to believe from experience in making observations for magnetic forces on board steel vessels that no reliable data can be gathered unless the vessel is in dry-dock. It has been the practice to undertake these observations while the vessel is in the water, but, under these circumstances, it always has more or less motion which seriously affects the results. The deflections produced on compass needles by the dynamos used for electric lighting are very decided, the difference being, in some cases, as much as 2°, and the superintendent recommends that the position of the dynamos should be a secondary consideration to that of the compasses. About 40 feet has been considered a safe distance between dynamos and compasses, but in determining this question the induction of magnetism in bulkheads and other vertical as well as horizontal steel and iron must not be overlooked. Trials should be made with the new marine dynamo to determine the safe distance at which it would be advisable to place the compasses. There is little or no danger from the current in the wires with the two-wire system used in the service, even when the wires are close to the binnacle, unless, of course, there is faulty insulation. An attempt was made to light the binnacles by electric light instead of oil, but it was found that by bringing an incandescent lamp close to the compass of standard navy size, a deflection of the needles could be produced. Reference is made to the probable difficulty which will be caused by the introduction of electric motors for training guns, etc. The superintendent states that with the compensating binnacle now used, generally speaking, two complete swingings of the vessel are necessary—the first to obtain the deviation table, and the second, after compensation, for the purpose of observing the residual deviations. If errors are now introduced by the dynamos or motors, one swinging more, at least, will be necessary to determine the deflections, even should they be constant. If it is considered that besides these errors the deviations are also affected by the retentive magnetism of the ship, it seems highly inadvisable to further complicate the problem. The only safe plan in using the mariner's compass is to eliminate all possible errors, even when they can be correctly applied, and with this end in view the most favorable position, magnetically, is carefully selected for the standard compass where the loss of directive force of the needles will be a minimum.

CORRESPONDENCE.

What is Transpiring in Electrical Circles at Boston, Washington, St. Louis and Chicago.

OUR WASHINGTON LETTER.

Washington City is gathering and piling up all the requisite material for a big bonfire, and if a conflagration does not occur, the escape from it may be set down as an undeserved interposition of Providence. An inextricable tangle of telegraph, telephone, incandescent and arc electric light wires, whose principal use appears to be to hold up the poles and pull down chimneys; interior wiring that would not pass inspection by an intelligent bell-hanger; not a protector on any telephone line in the city; buildings that would burn like kindling wood. Employés of every company owning lines know these facts; the attention of the municipal authorities and insurance officials has been repeatedly called to them; property owners have no means of escaping the danger. The Board of Fire Underwriters has had the subject of employing an inspector under discussion for several years, and have periodically decided to "defer action until the best method of electric construction is ascertained!"

The established custom of rotation in army circles has brought about the transfer of Major Raymond, from Washington to Philadelphia, much to the regret of many people who are interested in the proper development and progress of electrical construction in the District of Columbia. During the term of Major Raymond's service as engineer commissioner, he has become very familiar with the needs of the city in the matter of electric construction, and is now in a position to do valuable work in accomplishing much-needed improvements, could he remain in charge of the department. These changes are some of the misfortunes of disfranchised Washingtonians, but even with these drawbacks, they have no desire to exchange their commissioners for the average board of aldermen of neighboring cities—and very few of the subway commissions would tempt them. The successor of Major Raymond is Colonel Henry M. Roberts, who has been, for a number of years, professor of military engineering at the West Point academy. He is one of the best engineers in the army, a profound scholar, an authority on parliamentary law and a philanthropist. When he finds himself in the focus of the brilliant lights which will be turned on him by the representatives of scores of diverse electrical interests, he will have exercise for his varied accomplishments.

The Judson Pneumatic Railway Company has purchased a controling interest in the Brightwood Company, which has been running horse cars for about six months, and proposes to equip the line with the Judson system. The road is about three miles long, nearly straight, and the cars are permitted to run 15 miles an hour. As this will be the first passenger road operated by pneumatic power, its inauguration will be looked for with much interest.

The Activity of newly organized lighting companies, to do business in Washington City, has revived the scheme of utilizing the power of the Great Falls of the Potomac River, which are 16 miles above the city. At that point there is a fall of 80 or 90 feet, which will give over 20,000 available horse-power. One plan is to use the water power to force compressed air to the city and operate dynamos by pneumatic power. The Maryland side of the river, at the Great Falls, is owned by the government, and the Virginia side by a corporation managed by General B. F. Butler.

Washington, D. C., Feb. 7th. G. C. M.

OUR ST. LOUIS LETTER.

Mayor Noonan did not consider what was involved in taking down the dead wires, when he ordered their removal. Instead of 100 miles of wire, as reported, 1,000 miles hardly covers the amount, and of this at least 900 miles are in the business portion of the city. Though the work of removal was begun nearly a month ago, but 40 miles have been cut down, and that, too, at much inconvenience to traffic, the streets being completely blocked at times by the fallen wires.

Complaint Has Been Made of the Board of Public Improvements over their manner of carrying on the city's electric lighting. They are paying $96,000 a year for an electrician and four assistants to manage the construction of the plant and stringing of the wires. These electricians have been expending the city's money in tests of low tension currents, when high tension currents will be used for the city's lighting. Of this there is complaint, for though well enough for the alley lighting which is by the incandescent light, these tests will be useless for the high tension arc lamp lighting. Another complaint is that President Flad should send to Chicago, Ill., for his electrician, in place of using home talent.

The Following Detailed Information, in

respect to electric lighting, was received by the Board of Public Improvements and may prove of interest. The city of New Orleans has 934 arc lights of 2,000 candle-light power burning within its limits, 684 of which cost $125 per year; 262 suburban at $146, and 38 across the Mississippi at $205. At Cleveland, O., the lighting is done with 100 lights, eight of which, suspended from five high masts, are of 4,000 candle-power and cost $394.80; the 92 others are of 2,000 candle-power and cost $139.12 per year. Fort Wayne, Ind., is lit by 2,000 candle-power lights at $135 per year. Memphis has 100 arc lights of 2,000 candle-power. They cost the city $187.50 a year. 1,100 twenty candle-power incandescent lights are employed in Denver, Col., at a cost of $26 a year. For its 2,000 candle-power lights it pays $340. St. Paul uses fifty-four arc lights at 35c. a night; the lamps only running until midnight. The Thomson-Houston Company have just contracted with Omaha for 100 arc lights at $175 per year for five years. The Brush people furnish Detroit with its lighting, using 600 2,000 candle-power lights at $140 a year. Buffalo with its 1,223 lights, pays the electric companies $155.61½ a year. Three systems control the lighting of this city; 270 arc lights of 2,000 candle-power, are sufficient for the lighting of Milwaukee, for which the city pays $150 a year for each. Quincy, Ill., pays $100 a year for 181 lamps of 2,000 candle-power, and makes use of neither gas or gasoline. St. Joseph begins the new year with a system of electric lighting, using 210 arc lights at $70 a year. Pittsburgh employs both incandescent and arc lights in its illumination; of the former it has 1,000 of 25 candle-power at a cost of $16 per year, of the latter 300 are used of 2,000 candle-power and costing $105 per year. Kansas City, Kan., uses 96 arc lights of 2,000 candle-power and pays $144 for them. St. Louis, like Pittsburgh, uses both arc and incandescent lights in its lighting. 1,600 9,000 candle-power arc lights are used at $78 a year, and 1,600 incandescent lights of 30 candle-power; for 800 of which it pays $17.50 and for the remaining 800 $20 is paid. The arc lights are employed for the street lighting, while the alleys are lit by the incandescent.

Mr. Durant, of the Bell Telephone Company, wishes a bill passed in the city council allowing the Bell Company $15,000 to carry the police and fire departments' wires. The committee think, however, that they should carry them free in return for the franchise granting them the conduit. The Dorsett subway bill was passed under this condition.

The Union Depot Line which expected to have its electric division running by Feb. 15, will not, through unexpected delays, have this division running before March 1st. It has adopted the Boston system to avoid any trouble with the telephone companies. Its poles are up, cross wires strung, and the underground wire laid on four and one-half miles of track.

At the Annual Election of the Missouri Electric Light Company, the following directors were elected: S. M. Dodd, J. C. Richardson, J. C. Van Blarcom, J. W. Bell, E. Whittaker, T. H. West and R. C. Kerens.

Personal.—Two French engineers of prominence, MM. de la Jouanne and Seligman Lui, were recently in the city. They are representatives of the French Government and are carefully examining the different systems in this country. While here they were the guests of the Bell and Western Union people. One objected seriously to the unsightly poles and network of wires in the principal streets of St. Louis, and strongly advocates the underground systems. —C. L. Hutchinson, D. G. Hamilton and George P. Smith, all of Chicago, Ill., are in the city. They represent the syndicate which has purchased the Walsh street railway lines and the Broadway line. They are at present in doubt as to whether to adopt electricity or cables, but have definitely decided to change the motors of two of their lines to one of these two powers.

Suburban.—Nashville, Ill.: Within 60 days this city will be lighted entirely by electricity.—East St. Louis, Ill.: The Citizens' Electrical Supply Company has been organized, with a capital stock of $1,000. H. D. Saxton, S. B. Sager and M. D. Baker, are the incorporators. All the poles and wires are up and the plant built for the lighting of the city, and it only remains for the hanging of the lamps before the electric light will supersede gas.—Belleville, Ill.: A rumor that the Brosins Electric Light Company and the Belleville Gas Light Company would combine has spread. Edward Abend, an officer of the latter company, said that the combine was not made, but there were prospects of it. The gas company wish to take up the electric lighting of the city, and will make an offer to the city of $25 a year per light, the Brush system being employed. The city now pays the Brosins Company $120 per year for 80 lights, but their three years' contract with them expires on April 30th, and then, unless the combine is effected, the gas company will make an effort to secure the contract for the city's lighting.

St. Louis, Mo., Feb. 4, 1890. W. H. B.

OUR BOSTON LETTER.

Mr. John I. Drake has now sold the Narragansett Electric Light Company, of Providence, a total of 470 Russell mast arms. Mr. Drake's orders are increasing to such an extent that it may necessitate his seeking larger quarters.

The American Electrical Works, of Providence, are kept busy all the time. Mr. Phillips says they have orders for some time ahead. The new factory at St. Gabriel Locks, a suburb of Montreal, is a four-story building 100x40, with plenty of light. Water power is used to drive the braiding machinery which is being put in place as fast as the machines can be obtained. The Canadian tax on covered copper wire is 25 per cent., and the new factory will effect a saving to the company of something like $12,000 per year.

The Earnings of the Eastern Electric Cable Company, manufacturers of the well-known "Clark wire," for the past month were $11,873, showing an increase of 62 per cent. over the same period last year. The company is running day and night to keep up with its business.

A. Coburn & Son, of Hopkinton, Mass., will install a 300-light isolated plant of the Mather electric light system. The Mather Company also sold a 150-light electric plant in Staffordville, Conn.

Personal.—Mr. F. S. Pearson, chief engineer of the West End road, has been spending a week or two in Milwaukee. His visit was for the purpose of inspecting some large engines which are being built for his road by the E. P. Allis Company, and which are to be delivered in March.—Mr. M. M. Kimball, of the firm of Claflin & Kimball, New England agents of the Mather Electric Company, will sail for Europe about February 15th, on the "Celtic," of the White Star Line, New York. He is going solely on a pleasure trip, and will travel through England, Spain and Italy, and expects to return about the middle of April.

It is said that William F. Shearman, of Lowell, has established his claim of being the original inventor of the overhead trolley system, both single and double, and that a company with $1,000,000 behind them has been formed to push his claims. L. L. C.

Boston, Feb. 8, 1880.

OUR CHICAGO LETTER.

The Chicago Electric Club held its regular monthly meeting on Monday evening, February 3d. Mr. Dagenhart made a short speech asking that all members be present at the entertainment given the delegates to the convention, on Monday, February 11th. A paper was read by Elmer A. Sperry, entitled "The Operation of the Electric Motor by High Tension Currents." The paper was very interesting and instructive, and called forth quite a discussion, which was participated in by Messrs. Babt, Bliss, Dow, Ferguson and Perry. The attendance was very large.

Personal.—Mr Chalmers, of the Empire City Electric Company, of New York, was registered at the Sherman House last week.

At the Meeting of the Western Electrical Railway Association, January 29th, at the Grand Pacific Hotel, the following gentlemen were present: Dr. W. L. Allan, Davenport, Iowa; W. R. Moore, Moline, Ill.; W. L. Fergurson, Decatur, Ill., and G. E. C. Johnson, Lafayette, Ind. Owing to the absence of T. J. Evans, president, an adjournment was taken to June 11th.

Manager F. S. Terry entertained the hands of the various departments of the Electrical Supply Company, at the rooms of the Chicago Electric Club, Wednesday evening, January 29th. The elaborate *menu* was partaken of with relish, and the evening broke up after a pleasant discussion of mutual interest and profit. D. B. D.

February 4, 1890.

Changes in the Metropolitan Telephone and Telegraph Company.

At the meeting of the board of directors of the Metropolitan Telephone and Telegraph Company, of this city, held Thursday of last week, the resignation of Mr. Theodore N. Vail as president of the company was received and accepted. Mr. Charles F. Cutler was elected to fill the vacancy. Mr. Wm. R. Driver was elected treasurer of the company to fill the vacancy caused by the death of the late Mr. Amzi S. Dodd. Mr. Joseph Kavanaugh, who has long been identified with the company, and whose intelligent work entitles him to all honors, was elected to the position of assistant treasurer, and will have active control of the finances of the company. Mr. W. H. Wolverton, was elected director of the company in place of Mr. Dodd, deceased.

It is understood that Mr. Vail intends to devote himself to his many and varied other large interests, chief among which will be the matter of underground work in this city, with which he has long been identified, and where his great energy will find a field of a magnitude worthy of his best efforts.

The REVIEW hopes that the electrical field will not by any manner of means lose the active work of Mr. Vail, and is pleased to congratulate the Metropolitan Company on being able to secure as his successor a gentleman of the sagacity, experience and knowledge of the business possessed by Mr. Charles F. Cutler, who is widely known in telephone circles as the very successful president of the New York and New Jersey Telephone Company, and who has for some time past been the vice-president of the Metropolitan Telephone and Telegraph Co. Mr. Wm. Bouchelle has accepted the position of private secretary to the president, and is a very valuable man for that position, possessing the tact and ability which are sure to win success in that field.

City Contract.—Electric Light.

According to the decision of the Kentucky Court of Appeals, in the case of The City of Newport *vs.* The Newport Light Company, the provision in the charter of a light company authorizing it to furnish any city with gas, "or other light," upon such terms as may be agreed upon by the parties, is sufficient to empower any city, which has by its charter the general power to contract, to make a contract with the light company to furnish the city with electric lights.

The Secretary of the Electric Light Association Necrologically Considered.

The people and press of Kansas City have taken great interest in the Electric Light Convention which is being held there this week. The interest has expanded from a general to a personal one, and among the first victims is Mr. Garratt, well-known to readers of the ELECTRICAL REVIEW through his many able contributions. The Kansas City *Star*, in a recent issue, contains the following account of Mr. Garratt's life:

"Allan V. Garratt, secretary and treasurer of the National Electric Light Association, although still a young man, has had a varied and interesting career. Upon completing his education, in about 1878, he being then about 22 years old, he received an appointment on a geological expedition in the Southern States. During this expedition, he walked from the Mississippi river to the Atlantic ocean over a route about 1,300 miles in length.

"Upon his return to the North he was called to the island of San Domingo as chemist of a large mining enterprise. He remained there until several months after the breaking out of the Haytian rebellion, when, receiving a bullet wound during a skirmish, which temporarily unfitted him for active work, he returned to the United States. Having a fondness for applied physics, and having had some experience in the physical laboratories of Harvard, after he left the institute he returned to Boston and devoted himself to the study of electrical engineering. He practiced in Boston as a consulting electrician until September, 1887, at which time he became editor of *Modern Light and Heat*, making that journal, which was then a monthly, into a weekly. Under his editorial management the paper gained a reputation for a fearless and vigorous though conservative expression of opinion and unusual technical accuracy. In September, 1888, he severed his newspaper connection and accepted the secretary and treasurership of the National Electric Light Association. His active connection with the association dates from the Baltimore convention in February, 1886. He has personally edited and indexed its published volumes of official proceedings for the last seven conventions. As chairman of a special committee, and assisted by Mr. Eustis, son of the late Professor Eustis, of Harvard, and Mr. Kielholtz, of Baltimore, he made a report on the electrical and physical properties of copper conductors, expressed in metric values, which was a monument of mathematical work and is one of the ablest purely technical reports ever made by a committee of the association. He has for several years compiled the statistics of the electric light and power industries which have been published by the association and widely copied by the technical and the daily press.

"Mr. Garratt is a man slightly under medium height, quick of action and ready of speech, and has the reputation of being able to hold up his end of the rail in a debate, which characteristic he perhaps comes by honestly, being descended on the maternal side from a Scotch-Irish family, who were among the earliest settlers in New England, while on the parental side, his three immediate ancestors were officers in the Indian wars under General Scott, the war of 1812 and the Revolutionary war.

"To Mr. Garratt's systematic methods and to his zealous and untiring efforts, the National Electric Light Association owes much of its present prosperity."

In Honor of Mr. Madden.

FRIENDS OF THE PRESIDENT OF THE ELECTRIC CLUB GIVE HIM A FAREWELL DINNER PREVIOUS TO HIS DEPARTURE FOR EUROPE—A MOST ENJOYABLE OCCASION.

At the Electric Club, on Friday evening, February 7th, Gen. O. E. Madden was the recipient of a very elegant and *recherché* dinner, tendered him by some of his club friends previous to his departure for Europe, on Wednesday of this week.

About 50 gentlemen were present, and there were no vacant chairs to mar the scene. A beautiful ship of flowers occupied the center of the table, which was decorated with trailing smilax. At each plate was a delicate *boutonnière*. From an adjacent room sweet strains of music floated in and added their enchanting influence to the pleasure of the occasion.

It was truly "a feast of reason and flow of soul." Among the guests wns His Honor, Mayor Hart, of Boston, who, when called upon, replied with a graceful speech.

Mr. F. Z. Maguire and Mr. A. H. Patterson rendered original poems, which were received with laughter and applause, as they deserved.

General Madden, the genial guest of the evening, responded to his name in a neat speech. He is thoroughly at home as an after-dinner speaker.

The *menus* were extremely artistic, with spaces for autographs. When each blank had been filled out, the *menu* formed a pleasing souvenir.

The health of the first president of the Club, Mr. Henry C. Davis, now in Europe, was appropriately toasted, and ex-President Gilliland, who was able to be present though still in poor health, received quite an ovation, to which he responded briefly and pleasantly. All present were called on by the toastmaster, Mr. H. L. Storke, and new orators, as well as poets, were discovered in the Electric Club.

Among the gentlemen present were H. L. Storke, G. Worthington, A. B. Uline, C. O. Baker, Jr., D. Frank Lloyd, H. D. Stanley, J. J. Carty, Chas. W. Price, H. B. Thayer, W. D. Sargent, E. T. Gilliland, Lieut. F. W. Toppan, U. S. N.; W. L. Candee, J. C. Chamberlain, A. H. Patterson, F. Z. Maguire, F. E. Timpson, Fred. Lines, P. H. Alexander, E. A. Leslie, Geo. B. Coggeshall, A. V. Garratt, A. F. Stanley, S. S. Wheeler, C. P. Bruch, Paul T. Brady, F. B. Crocker, O. E. Madden, R. J. Steen, Hon. Thomas N. Hart, Mayor of Boston; Chas. W. Whitcomb, Captain Damrell, Captain Flanders, Dustin Killecutt, of Boston.

It is reported from Germany that the government has adopted the phonograph for use in the schools in that country.

The Boston *News Bureau* says that "the stock of the Thomson-Houston Electric Company has been underwritten to an extent that guarantees its success."

Dr. Werner Siemens has left the firm of electricians known by his name, and is intending to devote himself to scientific pursuits. The same course is being followed by his chief engineer, M. von Hefner-Alteneck.

Probably the only Chinaman in pursuit of electrical knowledge in this country, is Mr. Bert C. Lee, of Canton, China, who has been employed at the works of the Westinghouse Electric Company, Pittsburgh, Pa., for several weeks. Mr. Lee was sent to America at the expense of the Chinese capitalists who have contracted with the Pittsburgh firm for several large electric light plants in the Flowery Kingdom. Mr. Lee is here to study the Westinghouse alternating current system of electric lighting, and make himself sufficiently acquainted with the apparatus to take charge of the central stations in China. Mr. Lee is a very intelligent looking young man, and speaks the English language fluently.

The Okonite Thermometer.

The ELECTRICAL REVIEW is in grateful receipt of an elegant thermometer from that enterprising concern, the Okonite Company. It is sent to remind the public of the many good qualities of the Okonite productions. There are nearly three feet of the thermometer, and a beautiful red liquid, which looks good enough to drink, registers the degrees of heat and cold from "13 Park Row" clear up as high as "Okonite."

It is a little too large to put under one's tongue to test for fever, but it's just the thing to show a near-sighted editor how cold or hot he is.

Telephone News

*** "We have men here," says a Cincinnati paper, "who wouldn't believe in the telephone, until they were called up and dunned for an old debt over the wire."

*** A telephone has been established between Yokohama and Striznoka, a distance of 100 miles, in Japan, by order of the Mikado. It is the first in the country and works finely.

*** It is intended to connect Berlin with Vienna by telephone. Lines already exist between Berlin, Dresden and Breslau, and also between Vienna, Brünn and Prague, so that the completion of the connection will not be very costly.

*** The directors of the Northern New York Telephone Company held a meeting a few days ago, at which the following showing was made: Earnings for the quarter ending December 31, $3,773.34; expenses, $2,514.94. A quarterly dividend of 1½ per cent. has been declared.

*** A curious fact has been observed on the telephone line between Vienna and Buda Pesth. This line consists of three silicium bronze wires three millimeters in diameter, and during the recent frosts these wires were covered with ice to a thickness of from five to eight centimeters. The neighboring telegraph wires of iron, however, were only covered to a thickness of three centimeters. It is hard to see a reason for this difference, but the authorities are disposed to attribute it to the different rates of vibration of the two kinds of wire.

*** Manager Jacobs, of Chambersburg, Pa., has received instructions to begin the erection of telephone lines from Newville to Chambersburg, and from Chambersburg to Waynesboro. Mr. Jacobs will order poles at once and begin their erection as soon as the condition of the ground will permit of it. The line from Newville to Waynesboro will be 35 miles long. Thirty-two or 33 poles are required for each mile. The route will be the shortest possible from Newville to Shippensburg, along the Philadelphia pike, from the latter place to Chambersburg, and by way of the Waynesboro road to Waynesboro. In the near future the construction of a line from Waynesboro to Mercersburg is possible. This line would be built through Greencastle, Shady Grove and Upton.

*** **The Telephone Causing Ear Troubles.**—As civilization advances, new diseases are not only discovered, but actually produced by the novel agencies which are brought to bear on man's body and mind. The electric light has now created a new form of ophthalmia; and now we have the telephone indicted as the cause of ear troubles which reach on the spirits, and indirectly on the general health. M. Galle has observed, not in women only, but in strong-minded and able-bodied men, symptoms of what we call "aural over-pressure," caused by the condition of almost constant strain of the auditory apparatus, in which persons who use the telephone have to spend a considerable portion of each working day. In some cases, also, the ear seemed to be irritated by the constantly recurring sound of a bell, or by the nearness of the sounds conveyed through the tube, into a state of over-sensitiveness which makes it intolerant of sound, as the eye when inflamed or irritable, becomes unable to bear the light.—*British Medical Journal.*

That Government Telephone Case.

In the case of the United States *vs.* Bell Telephone Company, in the United States Circuit Court, at Boston, last week, a motion was heard, made by the plaintiffs, for an extension of time (three months) in which to take further testimony on their part. The defendants objected because the testimony to be taken was in reference to the Drawbaugh patent, which was not relevant testimony nor pertinent to the only issue in controversy, the alleged fraud of Bell in obtaining his patent. The government claimed that it was pertinent and that it had reference to other matters than the Drawbaugh patent, to the introduction of documentary evidence and also to the Rice patent, which, although admitted by the defendant to have been known to Bell, yet the court was not in possession of what Rice's patent was. The court said that if the United States, through their attorney, in good faith, said they desired to introduce further testimony, it did not think the time unreasonable in so important a matter, and it should be granted.

Col. Clowry Believes in Dynamos as Against Batteries.

Colonel R. C. Clowry, vice-president and general superintendent of the Western Union Telegraph Company, was in Kansas City recently. He travels in the private car "Electric," and was accompanied by Mr. M. C. Bristol, general superintendent of construction for the Western Union. Colonel Clowry is perhaps the greatest telegraph manager in the country, and is Mr. Gould's right-hand man in the Western Union affairs. He has charge of the Western Union from the Alleghanies to the Pacific Ocean, from the Gulf of Mexico to the British possessions. He arose to his present position from operator at a way station, and, unlike many, a salary of $25,000 a year has not raised him above ordinary mortals in his own estimation.

Colonel Clowry stated to a Kansas City *Times* reporter that the company was contemplating the removal of its local office from the present location on Fifth street, in that city, to some building further up town. The company is in no hurry to move, as the lease on the building now occupied still has over two years to run, but, nevertheless, it is looking around for some building up town more suited to its purposes than the present one. He was asked concerning his company's policy on the subway ordinance now before the council, but on the question as to whether it would comply with it, he was silent. He complained of the interference of electric light wires with telegraph wires, and thought that the high tension wires at least should go underground. Colonel Clowry expressed much satisfaction with the experiments with the new system of transmitting electric currents by substituting dynamos for the battery system. The system has worked successfully in New York, and before long zinc and copper sulphate batteries will be done away with entirely. The main office at Chicago uses 30,000 cells of battery costing $30,000 a year, and in less than two months the new system there will be complete. Nineteen dynamos arranged in rows and run by two electric motors, which derive their power from the electric light company's station, will be used.

FIG. 5.—THE SAWYER-MAN LAMP FACTORY. (SEE PAGES 1 AND 2.)

*** Judge Bundy has refused the application of the Wisconsin Telephone Company for an injunction against the Eau Claire Street Railway Company, based on the claim that in the operation of the electric street railway, the current escapes into the ground and is communicated to the wires and instruments of the plaintiff company. The case will be appealed to the supreme court.

*** The King of Belgium had a telephone line from his palace at Laeken to the Theatre de la Monnaie, in Brussels, in order that he might hear the performance without having to leave his palace, but he had no telephone connection with the royal palace and other government offices in Brussels, and when the palace at Laeken was burning the other day they had to borrow somebody else's telephone to send the King word about it.

*** For several days the Wisconsin Telephone Company on one side and the Eau Claire Street Railway Company and the Sprague Electric Railway and Motor Company, have been massing their forces in the city of Eau Claire, and the hearing for the temporary injunction asked for by the telephone company is in progress before Judge Bundy. B. K. Miller, of Milwaukee, attorney for the plaintiff, read the complaint and affidavits from experts and members of the plaintiff corporation. Letters from subscribers of the telephone company were also read, showing the feeling about the service of the telephone company as it now is, and placing the blame upon the street car company. The attorneys for the defendants read their answer and affidavits, among them affidavits by Thomas A. Edison and Amos E. Drawbaugh, supporting the answers. The case will occupy several days.

OUR LONDON LETTER.

A FURTHER REVIEW OF PROGRESS IN ENGLISH ELECTRICAL CIRCLES.

Messrs. Ernest Scott & Company, of Close Works, Newcastle-on-Tyne, only commenced the manufacture of dynamos and other electrical work towards the middle of the year, since which time the firm have been very busy upon dynamos of all sizes, arc lamps and electrical machinery generally. Standard dynamos are made in 15 sizes, from 1,000 to 60,000 watts, and even larger to order. From their experience, the two pole type has been found the most advisable up to five units, and is always used; the advantages of the multiple type applying specially to the larger machines. Since last August, 16 mills in Lancashire and Yorkshire have been installed, and over 20 complete arc and incandescent lighting plants have been shipped for foreign orders. A large number of dynamos have also been supplied to the trade for installation work. The firm have on hand series arc lighting dynamos and alternating machines and transformers of various sizes, and the prospects for the new year are considered as bright as could possibly be desired.

The Telegraph Manufacturing Company, of Helsby, have had a very heavy year, doubling their output during the last six months. There has been no lack of work in any of the departments, but the cable and gutta percha wire covering portions have been especially busy, and there are large orders for all classes of goods now on hand.

The United Electrical Engineering Corporation, of 2 Princes Mansions, Victoria street, Westminster, are principally engaged in the heavier branches of electrical engineering, electrical traction, telphic system of cheap transport, supply station and transmission, but also devote considerable attention to switch safety, junction regulating, gear and all general accessories. With regard to telpherage, a rigid rail line with the heavy grade of one in 11.5 has been sent from the Wood Green Station of the Great Northern Railway, up the hill to the Alexandra Palace. No inspection has yet been made, but I hear the suitability of telpherage for passenger and heavy goods traffic, under severe conditions, is well demonstrated. At the Eastpool Tin Mine, in Cornwall, a line of over a mile and a quarter in length is being constructed, and will transport 1,000 tons of tin ore per week. The corporation have also on hand an order for a telpher line in Rome, and contracts are being negotiated for lines in South Africa, which presents an exceptionally favorable field, and other parts of the world. Particular attention is also being bestowed by the firm to the subject of electrical traction, and the switch gear for the Northfleet line was made at the company's works; they have now on hand a large amount of material for a tram line on the series system in Italy. The Jablochkoff patent has made great strides during the last year, and many of the principal firms have agreed to pay royalties. The works have been engaged for the principal supply companies upon high tension supplies, the essential feature being the impossibility of the conducting parts being touched except by deliberate intent. During the present year arrangements are in progress by which the corporation will interest itself in a greatly increased amount of supply station work of heavy character in respect to plant

requirements. Material assistance is acknowledged gratefully to the co-operation of Messrs. J. G. Statter & Company, Limited, of West Drayton, from whom are obtained the heavier parts of their plant requirements.

Messrs. Willans & Robinson, Limited, of Thames Ditton, Surrey, show a great increase in business, notwithstanding the difficulties in the carrying out of orders, owing to the great fire in November, 1888, and the limited producing power of the temporary machine shops until the new ones were ready last summer. This one firm have turned out electric light engines capable of indicating about 18,000 horse-power, which points out the high reputation of the Willans engine and its direct driving system, as well as the progress of electric lighting through the country. Out of the 18,000 horse-power referred to, not more than 1,000 horse-power has been for abroad, about 4,000 is for ship lighting, and the balance for land installations in England. Central stations, of course, claim the larger portion. The Metropolitan Electric Supply Company, through the Electric Construction Corporation, take 3,500 i. h. p. for the Rathbone place and Manchester square stations alone; the St. James and Pall Mall Company, whose installation was carried out by Messrs. Latimer, Clark, Muirhead & Company, 22,000 i. h. p.; Messrs. Crompton & Company, for the Kensington and Knightesbridge Company, over 1,200 i. h. p.; the Liverpool Electricity Supply Company, about 1,500 i. h. p.; Messrs. Siemens, for the Bradford Corporation Station, under Mr. Shoolbred's supervision, 300 i. h. p., capable of larger output if required; the Brush Electrical Engineering Company, for the Chelsea Electric Supply Company, nearly 500 i. h. p.; the Taunton Electric Light Company, 300 i. h. p., and others. Among large installations, two may be mentioned, both through Messrs. B. Verity & Sons, for D'Oyly Carte, for the Savoy mansions and hotel, theatre, etc., about 650 i. h. p., and another for the new theatre in Shaftesbury avenue, about 400 i. h. p. The General Post Office has ordered two complete installations, including dynamos, but not other electrical work, and amounting, collectively, to 400 i. h. p.; and the Gulcher Company, two engines of 60 i. h. p., for the post office at Rio de Janeiro. The admiralty has also been a large customer, taking some 60 engines, and mostly of large size. Messrs. Sharp & Kent have taken about 500 i. h. p.; Messrs. Mather & Platt, 300 i. h. p.; the Great Western Railway Company, for three new Channel steamers, 75 i. h. p.; Hotel Metropole, at Monte Carlo, 120 i. h. p.; for the Hotel Metropole, at Brighton, 240 i. h. p.; the Grand Hotel, Charing Cross, London; Elmore's Copper Depositing Company, 160 i. h. p.; Elliott's Metal Company, 250 i. h. p., and a number for mills and mansions, etc. The prospects for the coming year, principally, of course, for central stations, are most satisfactory.

Messrs. B. Verity & Sons, of Covent Garden, London, report a most busy year and a grand outlook for the coming months. Business has been done with every electrical firm of standing, and during the year three times as many fittings have been supplied to the trade as the year preceding. The show-rooms have been greatly altered and inproved, and there are now on exhibition nearly 3,000 different samples of newly designed fittings for brackets, electroliers, etc., including the best designs on view in metal department of the Paris Exhibition, and which it is intended to incorporate in new designs, to be brought out within the next few months. As a motive power, Messrs. Verity are paying great attention to electricity, especially in the matter of ventilation, and the firm have brought out an improved air propeller which would appear to have many advantages over those in general use. In regard to the company's installations, some of the more important were those at the Duke of Fife's new mansion in Portman Square, worked by a 14 horse-power gas engine; the Savoy Hotel, the largest private plant in the world, and which I described to you in one of my preceding letters; Sir John Pender's residence, at Foot's Cray; the Grand Hotel, Brighton; the Bank of Scotland; Exeter Hall, Strand; Messrs. Coutts' Bank; the New Theatre Royal, and several hotels and houses at Exeter, and half a dozen of the Atlantic Liners. During the last 11 months Messrs. B. Verity & Sons have used on their own works over 24,000 incandescent lamps, in some 110 separate installations, being an average of over two installations per week. As to work on hand now the machinery is being erected for D'Oyly Carte's new theatre in the Charing Cross Road with a plant of total capacity of nearly 3,000 lights and which will be ventilated by fans and electric motors. There are several large installations on hand throughout the country and machinery is being put up for an important installation at Buenos Ayres, including the wiring for the electric lighting and bells and the fittings, the latter being most elaborate in character.

OTHER MATTERS OF INTEREST.

On the 9th January, at the Institution of Electrical Engineers, an inaugural address was delivered by the president, Mr. J. Hopkinson, M.A., D.Sc., F.R.S., who took as his subject the very wide one of magnetism.

The Royal Meteorological Society held its annual meeting on the 15th inst., when an address was given by the president, Dr. W. Marcot, F. R. S., and a number of new Fellows were elected.

The Institution of Civil Engineers, which was founded in January, 1818, now numbers 1,673 members, 2,698 associate members, 19 honorary members, 436 associates and 968 students, a total of 5,804, and an increase of nearly 200 during the last year.

So Great Progress has been made with the London and Southwark Electrical Railway that it is expected to keep its promise of being opened in the spring or early in the summer. The two tunnels, which are independent of one another, have been cut for the greater portion of the route through London clay, and, owing to a remarkable dip in one place to a depth of 35 feet below the bed of the Thames, very great delay was occasioned. It is suggested that this may at one time have been a channel of the Thames and is now filled up to within five or six feet of the surface with loose sand and watery gravel. While a daily progress through the clay was made of about 14 feet and even up to 16 feet, the daily distance cut through the gravel is only four feet six inches. One of the tunnels is now completely through, and in the other the distance to be traversed is only some 150 yards. The locomotives to be used on the subway have been tried and shown to be capable of moving a loaded train at a speed of 25 miles an hour with great ease.

With Regard to the Taxing of Telephone Tramcars, an interesting case came before the Edmonton Petty Sessions last week. The Mines and General Telephone Company, of 12 Great George street, Westminster, were summoned by the Inland Revenue for having kept five carriages without a proper license. For the defence the company claimed their line, which ran from the Alexandra Park entrance to the doors of the Palace, was a railway, The invention was a new one and the present case was simply a test one, the carriages did not fly for hire and could not be stopped between the fixed stations. After a short consultation the chairman announced their decision that the carriages referred to did not come under the definition of carriages subject to taxation, and that the running on rails was sufficient reason for exemption. A notice of appeal was given and the sooner a definite decision is arrived at the better for all parties.

The Board of Trade have published their draft regulations for the securing of the public safety, and for ensuring a proper and efficient supply of energy. The draft is to be referred to various authorities and interested bodies before being finally decided, and there certainly would appear to be infinite room for discussion and dispute in regard to many of the clauses.

Death of Mr. Lever.—The death was announced last week of Mr. Charles Lever, a well-known electrician both in Europe and America, a member of most of the electrical societies, and one who had given to the world several excellent inventions, the best known being his arc lamp. He was only 28.

The Brush Electrical Engineering Company, Limited, gave a banquet on the 6th inst. at the Metropole Hotel. Lord Thurlow presided, and the toast of the evening, the Brush Electrical Engineering Company, was proposed by Sir Frederick Bramwell. There was an excellent performance of music during the evening.

Messrs. Fowler & Lancaster have turned their business into a limited liability company with a capital of £22,000.

Messrs. Greenwood & Batley, of Leeds, are likely to experience the discomforts of a strike, as the whole of their hands, some 2,000 in number, have given in their notices over some petty dispute as to whether a certain man put to work at the lathe was a skilled or an unskilled workman. There is no doubt that some way must be soon discovered to combat the impracticable and unjust demands of the workmen.

The Metropolitan Electric Supply Company brought pleasure to many a miserable dwelling round the poor neighborhood of Sardinia street, Lincoln's Inn Fields, by the Christmas treat given last week to some 1,200 children of the district.

Mr. Charles Burt has taken the position on the board of the Anglo-American Telegraph Company, vacant by the death of Sir Daniel Gooch, and has given up his practice as a solicitor.

Professor James Thomson, of Glasgow, who has given us so many useful terms, has now coined another "word" signifying line and direction in a line; that which is represented ordinarily by a barbed arrow. In the *Philosophical Magazine* the word is made use of by his brother Sir William Thomson. "I now define the word of magnetization as the word in which the magnetizing force urges a portion of the ideal northern magnetic matter or northern polarity."

London, Jan. 15. CHARLES FFRENCH.

Prof. Alexander Graham Bell Dined in Omaha.

The officers and directors of the Nebraska Telephone Company gave a banquet to Prof. Alexander Graham Bell, the inventor of the telephone, and one of the foremost and most enthusiastic instructors of deaf mutes in this country, at the Union Club, in Omaha, recently. Prof. Bell was in Omaha for several days on a tour of investigation of the deaf mute institutes in that section, particularly the Nebraska Institute. On the eve of his departure for his home in Washington, the members of the telephone company availed themselves of the opportunity to show their appreciation of the ability and genius of Prof. Bell by tendering him a banquet.

The guests and members of the club began arriving about eight o'clock and assembled in the parlors. At nine o'clock supper was announced, and the guests repaired to the banquet chamber, where a gorgeous sight met their view. Two long tables, arranged in the form of the letter "T" (for telephone), were handsomely decorated with an elegant hand-painted dinner set, flanked with wine glasses of various colors and shapes.

The guest of the evening was assigned to the post of honor at the middle of the "T." The following gentlemen were seated at the table:

Governor Thayer, Mayor Cushing, Col. M. V. Sheridan, E. W. Nash, D. H. Wheeler, Sr., J. L. McCague, C. V. Gallagher, W. H. Alexander, H. D. Estabrook, Dr. Geo. L. Miller, C. L. Chaffee, E. P. Davis, Clement Chase, J. W. Rodefer, J. J. Dickey, Frank Warren, S. L. Wiley, G. W. Lininger, Joseph Barker, W. W. Morsman, R. B. Howell, of Detroit; A. Shillinglaw, of Chicago; L. H. Korty, L. M. Rheem, W. F. Bechel, E. M. Morsman, Judge J. W. Savage, B. B. Wood, H. Kountze, Jno. A. McShane, C. Hartman, L. H. Tower, E. Rosewater, Judge E. Wakely, Judge G. W. Doane, D. H. Goodrich, F. Drake, Mr. Rothert, of Council Bluffs; J. A. Gillespie, M. E. Taylor, T. F. Mosely, Adolph Meyer, Dr. E. W. Lee, J. J. Everingham.

After the menu had been discussed, Mr. J. J. Dickey, general manager of the local office of the Western Union Telegraph Company, rapped the company to order, and in a few remarks, explanatory of the occasion, presented Mayor Cushing, who expressed great pleasure at being in the company of a man whose fame is as widespread as that of Prof. Bell. He said that all were greatly pleased to meet with the professor, and extended to him the welcome of the city.

Governor Thayer was introduced and said that he had come with the understanding that he would not be called on for a speech. He expressed great pleasure at meeting with such a noted man, and enumerated the many advantages of the telephone in business as well as social life. The men who invent these most useful instruments are indeed benefactors. The invention of the telegraph, telephone and steam engine, have revolutionized the affairs of nations. When the great generals of the world are lost to recollection, the names of the inventors of the steam engine, the telegraph and the telephone, will stand out on the pages of history in letters of fire. In concluding, Governor Thayer said: "I am glad to meet with Prof. Bell and take him by the hand and thank him for his presence."

Prof. Bell was then introduced, and spoke briefly upon the telephone and the annoyances incidental to its use caused by induced currents, etc.

Prof. Bell was listened to very intently, and at the close of his address was loudly applauded.

Mr. Rosewater, Judge Wakely, Mr. Henry Estabrook, Prof. Gillespie, Mr. Morsman and Mr. Hartman, followed with brief speeches, after which Prof. Bell's health was drunk and the guests separated.

United Electric Company.

The United Electric Company, of Salt Lake City, is a pushing, promising business enterprise, worthy of public patronage and general recognition. This company has just put a valuable electrical machine into the Walker Opera House, which lights the gas burners all through the house in the neatest, quickest and surest manner imaginable. The machine is a frictional one, and by merely turning the crank, electricity is generated and stored in a condenser until any amount within a given limit is secured. Then when the burners are to be lighted, all that is to be done is to turn on the gas, give the crank of the machine a turn, and, presto! the burners are all lighted. Connections are so made that any set or group of burners can be instantly lighted; and there is no such thing as fail about this machine. It ought to be adopted generally.

TELEGRAPHIC

.... A telegraph line has been completed between Fayetteville, N. C., and Wilmington, along the west bank of the Cape Fear river, without touching a railroad.

.... A message recently sent by telegraph from Portland, Ohio, to Hong Kong, by way of New York and London, cost $2.37 a word. An answer was received in 12 hours.

.... A company is being organized of Sioux City and Sioux Falls capitalists to build a telegraph line between the two cities, and have it operated by the Postal Telegraph. Company.

.... The Commercial Union Telegraph Company are putting up wires preparatory to opening an office in the Board of Trade rooms in Auburn, Me. The office will probably be opened some time next week. The Auburn as well as the Lewiston office will be under the management of Mr. John Neil.

... The Commercial Union Telegraph Company, of Cohoes, N. Y., has filed a certificate of increase of capital stock, $300,000 to $500,000, in the secretary of state's office. It is the intention of the company to connect Albany with Kingston, Rondout, Newburg and New York, with branch lines to Poughkeepsie and Pawling.

.... The Chefoo telegraph convention has at last been ratified by the Tsung Li Yamen. It is an agreement between the Chinese Telegraph Administration and the Eastern Extension and Northern Telegraph Companies, to act in concert in the matter of telegraph rates to the far East. A uniform rate of $2 per word from all parts of China to Europe will be charged.

.... The Chicago office of the Western Union Telegraph Company is making changes in its working plant which will mark an era in electrical telegraphy. The innovation consists in doing away with the cumbersome zinc-copper-sulphate batteries and using in their place dynamos. The experiment has been made on a small scale in New York, but only on main-line work.

.... The Postal Telegraph Company has completed its line to Emporia, Kan., and has opened up an office there. The company is pushing its lines forward with Galveston and Salt Lake City as termini of the two principal lines. At Salt Lake City the line will connect with the company's lines, the company already having a system in operation on the Pacific coast, and operated around by St. Paul to New York.

.... It is stated that John W. Mackay, has dropped over from Europe for the double purpose of extending his telegraph lines and taking some part in the Nevada canvass in favor of Senator Jones, who desires re-election. The Mackay telegraph investments are now estimated at $11,000,000, principally represented by the postal telegraph lines and the Mackay cables. They also claim that he has been offered $19,000,000 cash for these interests, which, they add, are not for sale. It is said that he proposes to expend about $3,500,000 more in building up his telegraph system, and that he will make these expenditures out of the income derived from both companies—the telegraph lines and cables—and that when this shall have been done, the earning power of the latter will equal that of the Western Union.

Erie Telephone and Telegraph Company.

The following is the report of this company for the quarter ending Dec. 31:

	1889.	1888.	Inc.	Dec.
Gross	$183,788	$175,039	$8,744	
Expenses	111,973	122,563	.....	$10,590
Net	71,810	52,476	19,334	
Construction, new,	13,335	10,564	2,701	
Balance	58,455	41,912	16,543	
Dividend	48,000			
Surplus	10,455			
Subscribers added,	298	126	167	

The Erie Telegraph and Telephone Company has declared a quarterly dividend of one per cent., payable Feb. 17, to stockholders of record Feb. 8. Books closed Feb. 8 to 17.

* * Burlington, Iowa, is giving an electric railway company a 30-year franchise.

* * An electric railway between Augusta Me., and Hallowell, is being built, and wil be in running order by July.

* * The Thomson-Houston Company has received an order for the complete equipment of 100 motor cars for the St. Paul and Minneapolis street railway lines, and for 60 electric locomotives to be used between the two cities for regular train work.

* * The new South Side Street Railway Company, of Pittsburgh, will adopt electricity as a motive power instead of a cable road, as first proposed. The success of the Pleasant Valley road has led to the change. The Thomson-Houston Company has the contract for the plant.

* * One of the electrical publications (ELECTRICAL REVIEW) illustrates a device for rapid traveling that would be exhilarating. It is on the bicycle principle, with two wheels tandem running on a heavy wire on telegraph poles. It is kept in position by grooved wheels on a second wire 10 feet above. It is operated by electricity, and is estimated to make about 90 miles an hour. When it comes into use, Nellie Bly can make her trip in several days less.—*St. Paul Globe.*

* * The new buildings for the electrical engineering course at Princeton College, Princeton, N. J., are almost completely equipped with instruments and machinery. The addition of this course to the Princeton curriculum will very soon be the means of largely increasing the number of students. The buildings show the result of great skill in plan and design. Any one visiting the Electric Observatory for the first time, notices particularly the isolated location of this building. The building has been erected in the northeast corner of the president's grounds in order that it might not be near enough to other buildings for the iron used in their structure to affect the delicate instruments in the observatory.

The Mather Electric Company Increasing its Facilities.

The Mather Electric Company, at Manchester, Conn., which has done a great deal of business in a quiet way, and which has been very successful in placing its plants in all directions, has found it necessary to increase its manufacturing facilities, which already were quite large and convenient. April 1st the company expect to break ground for two additions to the factory, one of 250 by 40 feet, two stories in height. The lower story will be used by the Mather Company for magnet winding, assembling and testing. An addition of a new steam engine and boiler room 75 by 50 feet will be added also, the present engine and boiler room to be used for machinery only.

The upper story of the larger building will be used by the Perkins Lamp Company, to still further increase the manufacture of their incandescent lamp, which is meeting with much popularity.

This will give the Mather Company a chance to double their product and possibly enable them to catch up with their present orders which are now nearly three months behind. The Perkins Lamp Company is also behind in the matter of filling orders.

The REVIEW congratulates the management of the Mather Company on this evidence of success and prosperity. Though conservatively run, this company has been successfully managed, and both for the merits of the system and for the business-like principle on which its business has been conducted, deserves the fullest success.

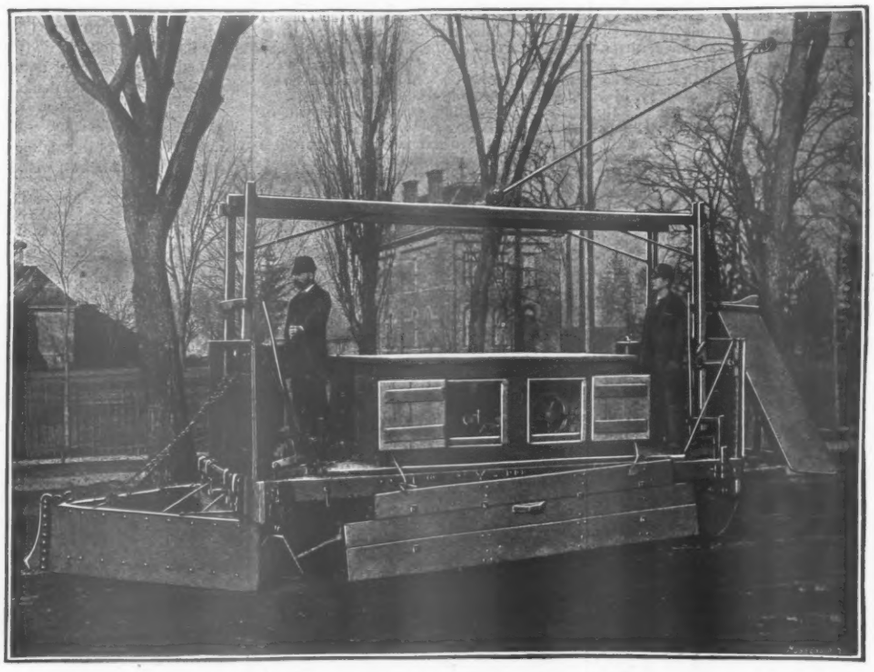
Sprague Electric Snow Plow.

A new electric snow plow, which has just been manufactured by the Sprague Electric Railway and Motor Company, is illustrated on this page. It is fitted with two 15 horse-power improved motors, and is so arranged that it can be run either forward or backward, similar to a Sprague electric car. The reduction in gearing between the motors and the car axles is greater than in the ordinary Sprague car, so that a large amount of power is available from the motors in case of necessity.

It is estimated that this plow will clear the track more speedily and effectually than an ordinary snow plow drawn by 12 horses.

The view shown is from a photograph of a plow which has been in operation for some time on the Troy and Lansingburg Street Railway, Troy, N. Y. Although the season has not offered any chance to show the capabilities of this plow on that road, it has effectually taken care of several light falls of snow which have obstructed the tracks this winter.

We understand that the Sprague Electric Railway and Motor Company have nearly completed a special sweeper and track cleaner for clearing the track of dust, dirt, slight snow falls and other impediments.



SPRAGUE SNOW PLOW.

Tests of an Interior Conduit.

On February 7th, at the works of the Bergmann Electric and Gas Fixture Company, this city, some very satisfactory tests of the conduit manufactured by the Interior Conduit and Insulation Company, 16 and 18 Broad street, were made. A room was fitted up with the conduits as it would appear in actual practice, and the various kinds of accidents liable to happen to interior wires were purposely caused to wires contained in the tubes, and also to the wiring as ordinarily done. This was to afford a relative example of the two systems. Wires in the conduits were heated by means of abnormal currents until the insulation became ignited, and finally the wires themselves were melted. The tubing perfectly protected the wood-work to which it was attached, while the unprotected wires set it in a blaze.

The conduit is made of paper in various sizes, and is chemically treated, and then covered with a black compound which renders it moisture and fire-proof. It is put up in very much the same manner as gas pipe, and the wires drawn through it.

The principal witnesses of these tests were city officials and insurance men from this and adjacent cities. Among others were noticed Mayor Hart, of Boston; Mayor Pingree, of Detroit; Mayor Newhall, of Lynn, Mass.; Mr. P. H. Alexander, of the Westinghouse Company; and Professor Barker, of the University of Pennsylvania.

After the exhibition, the company provided a delightful lunch at the Hoffman House.

Letter to George William Curtis in Defence of the Electric Wires.

Mr. Francis R. Upton, treasurer and general manager of the Edison Lamp Company, has sent the following letter to Editor Curtis, of *Harper's Magazine*, in defence of the assertion that the Brooklyn Tabernacle fire was due to electric wires. From the mass of evidence accompanying the letter, it would seem that Mr. Curtis has been unfortunate in his selection of an example illustrating the dangers of the electric current. We append the letter in full, omitting only the letters which confirm what Mr. Upton says:

NEW YORK, February 4, 1890.

GEORGE WILLIAM CURTIS, Esq.,
Harper's Magazine, New York.

Dear Sir: On page 477 of the February number of the *Harper's Magazine* is the following:

"It is shrewdly suspected that the Brooklyn Tabernacle was kindled by them" (the wretched wires), "and not, as was wildly suggested, by the fervor of the pastor's eloquence."

The attached documents are forwarded to you to show that the Tabernacle fire was not caused by electricity. The general manager of the Brooklyn Edison Company states that the current was completely turned off at the switchboard on Saturday night by his own men, and that there was no current on the light wires in the body of the house during the night. After the fire, the fact that the switchboard and meter were untouched, and before the fire, that there was no evidence of crosses occurring on any of the wires, is fully discussed by the manager, and seems conclusive evidence that there was no trouble in the Tabernacle from electric wires.

The Committee of the New York Board of Fire Underwriters in its report to the Board, state that

"There was not the slightest evidence to show that the fire was caused by the electric light equipment."

This is further corroborated by the report of Halsey & Pitcher, of the Liverpool, London & Globe Insurance Company, who were adjustors for the company, and concluded their report by saying:

"We feel that in this case the electric light conductors are not responsible for the fire, nor did they aid it."

This report gives the probable cause as follows:

"It is just as fair to assume the fire to have started from careless tuners or defective flues as to attribute it to lightning. It appears that no one has been discovered who saw the lightning strike the church, nor was there any evidence of destruction by lightning; the theory finding its greatest support in the fact that a thunder-storm raged at the time the fire started."

Mr. F. E. Jackson, who has investigated this matter for me, reports that the new Tabernacle will be lighted in the same way as the old one, namely, electric light.

Generally, fire destroys all the evidence of its cause. In this case, very fortunately, the evidence that the fire was not caused by electric light remains, while the evidence as to what caused it, experts were not able to obtain.

When people are talking of any epidemic of sickness, every ailment is considered to be part of the prevailing sickness, so with the blame placed upon the electric light. To-day, for selfish reasons, electric light is being advertised as dangerous, the result being that many people consider electric light should receive credit for being the cause of all unknown fires when electric wires are present in a building.

All artificial lighting is more or less dangerous, the relative danger should be best known by insurance companies, whose business it is to investigate such matters. The accompanying report gives the various views of the New England Insurance Exchange, one of the ablest bodies in the country, in which the conclusion is reached

"That the system" (of lighting by electricity), "properly guided by a knowledge of electrical laws, and guarded by the various well-known automatic safety devices and current regulators, stands pre-eminently as the safest method of artificial lighting in vogue."

Under date of April 2, 1888, reductions in tariff rates in New England are made under certain conditions when electric lights are used.

On January 4, 1890, the statement is made by Mr. S. E. Barton, chairman of the Committee on Electric Light, of the New England Insurance Exchange, after many years' experience:

"I am of the firm opinion that we could secure profit to our companies if we were to extend the granting of rebates for the exclusive use of incandescent lights to all classes of so-called 'mercantile' or store risks, and thereby banish the gas jets, which ignite goods in show windows, and the kerosene lamps which explode in cellars."

Mr. Barton is a well-known authority in insurance matters.

The question of danger to life, which you mention later on page 478, should be qualified by the statement that there is no danger to life in cases where low tension currents are used.

I think, if you will read carefully the documents submitted to you, and, if not satisfied, either investigate yourself or empower some impartial man to investigate for you, the dangers of electric lighting, you will reach the conclusion that you have fallen a victim to the designs of selfish men in lending your powerful aid to the out-cry against electric lighting.

Saving the Broken Lamps.

Baker & Company report that owing to the recent large advance in the price of platinum the local electric light companies are paying more attention to their broken lamps, and are shipping their old stems in to a greater extent than ever before, and that the metal derived from that source has an appreciable effect upon the market. This also shows that the light companies are working their waste closer than heretofore.

Through Parlor Car Express to Atlantic City via Pennsylvania Railroad.

Beginning February 7th the Pennsylvania Railroad Company will inaugurate a fast train service between New York and Atlantic City. The train will be composed of parlor cars and day coaches, and will run through to Atlantic City on the quickest schedule ever used between the two points. The Atlantic City Fast Express will leave station, foot of Cortlandt and Desbrosses streets, every week day at 2 P. M., and arrive at Atlantic City at 5.35 P. M., running through in three hours and thirty-five minutes. The east-bound express will leave Atlantic City at 9 A. M., and arrive in New York at 12.40 P. M.

The Sperry Electric Company.

The Sperry Electric Company, of Chicago, have placed upon the market their new style double-pole switch for arc work, shown

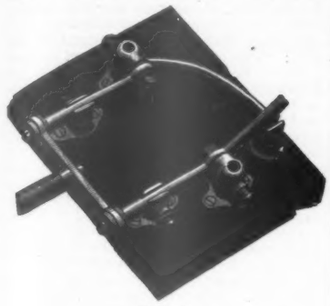


FIG. 1.

in Fig. 1. It is said to be absolutely non-sparking, as it makes contact before it breaks. Illustration No. 2, shows the same

FIG. 2.

switch as applied to a hanger board for an arc lamp.

A new weather-proof hood is shown in

FIG. 3.

Fig. 3. It fits over the rod pipe and is held firmly in place by the jam nut on the top of the rod pipe. It is claimed that by this little device the trouble of the hood becoming dislodged by the wind is overcome.

—— The consolidation of the two electric light companies in Nashville, Tenn., was finally consummated by the formal transfer of the franchises, wires, poles, plant, etc., of the Nashville Light and Power Company to the Capital City Electric Light Company. The consideration upon the sale made was $60,000 in stock and $50,000 in first mortgage bonds of the company, the plant of the Light and Power Company to be turned over free and unincumbered. The new company will at once provide $40,000 additional working capital and proceed to increase the plant.

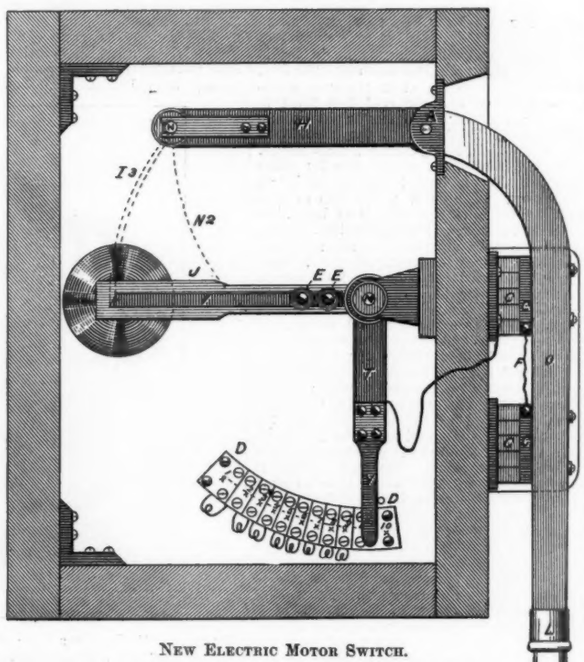
—— A cable message from London, England, for Westinghouse alternating current apparatus for 30,000 incandescent lights, has been received at the Pittsburgh office of that company. The order came from the Metropolitan Electric Supply Company, Limited, of London. The same organization has already several plants in the English metropolis which are all fitted out with machinery from Pittsburgh. The cable states that the shipment of the machinery must be made immediately. The entire outfit for this plant, consisting of Westinghouse engines, dynamos, exciters and other electrical appliances, will be got ready for shipment immediately.

Doyle's Motor Switch.

The cut herewith presented is an excellent representation of a recent invention by Mr. Chas. B. Doyle, of Chicago, Ill. As will be seen at a glance, it is extremely simple, and a brief description will show that it is equally effective for its purpose—the gradual throwing on of the current for power or other applications of electricity.

The switch in the cut is represented as "on." When the motor is at rest the lever O is sustained by the spring catch N on the arm H which engages with the rod I on the weight arm J. H is a right angled continuation of the switch lever L, L_1 and O, the whole moving on a center A. The motor being at rest, when the switch is closed by depressing the lever L, the catch N will describe the arc shown by the dotted line N_3, carrying the arm J until the moment when the contacts are made at C C by C_1 C_1. At this instant catch N lets go by slipping off the rod I, and releasing the weight arm J, this latter commences its descent. The arm T V is part of and moves with the weight arm J, upon the center M. The contact plate V makes a gliding contact successively from the limiting stop D_1, over the segments X_1, X_2, X_3, etc., to the stop D. This motion is regulated by a ratchet and adjustable vibrating escapement governor on the shaft M, so that any required speed may be attained to suit the necessities of the particular case. In order to perfectly time the release of the lever J with the contacts at C C and C_1 C_1, the rod I is adjustable longitudinally and held by means of the two screws E E.

The lever contacts C_1 C_1 are insulated from the lever O, the only connection between them being through the fuse wire F. This fuse wire is covered from chance contact by shields on the box, so that it is impossible to replace a fuse which has burned out without first shutting off the current by raising the lever and stopping the motor.



NEW ELECTRIC MOTOR SWITCH.

—— Last week the insurance inspector of the company in which the Salmon Falls Manufacturing Company buildings are insured, at Dover, N. H., visited that place and inspected the wiring for electric lights that had been done there, and pronounced it safe. Mr. Brown, the agent, then withdrew his objection to the lights.

—— The Electric Lighting Company has been organized in East Orange, N. J., with James C. Bayles, ex-president of the Board of Health, as its president. The stockholders are among the best-known people in East Orange, and the company is ready to begin work. As soon as the necessary franchise can be obtained from the township committee, it is proposed to lay subways beneath the sidewalks. It is also proposed to use the Edison incandescent system, both for street and domestic uses. The latter only will be put into operation at first, as the present street lighting contract does not expire until a year from May 1.

—— All the naphtha lamps that have been in use in Hartford, Conn., are to be replaced by electric lights. The whole number of naphtha lights in Hartford's streets at present is 177, and about 68 electric arc lights will be required in lighting the territory covered.

—— Shippey Bros. have been appointed the English agents of the Mather Electric Company, and will be situated in London. R. N. Varnum will represent the company in Yokohama, Japan. W. A. Wright, who has been the agent for the Brush Electric Light Company in the South, was appointed Southern agent for the Mather Company on January 1, at Greenville, S. C.

—— Mansfield, O., is contemplating the establishment of an electric light plant, to be owned and operated by the city, for lighting the streets and public buildings, the city having been unable to make a satisfactory contract with the local gas and electric light company. Authority will be asked from the State Legislature for the issue of bonds sufficient to meet the expenses. The advocates of the plant claim that it can be established for $20,000, but others hold that it cannot be built and equipped for less than $50,000.

—— During the month of January, central station plants in the following places adopted the Westinghouse alternating current system of incandescent lighting: Jacksonville, Ill., 750; Gouverneur, N. Y., 750; Sacramento, Cal., 1,500; Hampton, Va., 750; Allentown, Pa., 1,500.

—— Sacramento, California, is at last to have an electric light plant. For years, the councils of that thriving town on the Pacific coast have been investigating into the different methods of electric lighting. A contract for alternating current apparatus of 1,500 lights was given to the Westinghouse Electric Company.

—— The Metropolitan Electric Supply Company, Limited, of London, England, is about to add a large increase to its electric light plant in the English metropolis. The Westinghouse Electric Company was awarded the contract a few days ago for alternating current apparatus of a capacity of 15,000 lights.

—— The Malden, Mass., Electric Company, has declared the usual quarterly dividend of two per cent., payable Jan. 15. This company is capitalized for $200,000, one-half in six per cent. bonds, and the balance in stock paying eight per cent. The net earnings exceed the $14,000 required for the two payments, and the plant is valued higher than the capital on a cost valuation. The company lights Malden, Melrose, Medford and Everett, 25 square miles of territory, and it has the equivalent of 500 arc lights in use, against 85 two years ago.

ELECTRIC LIGHT NEWS

—— Marquette, Mich., has accepted its electric light plant from the contractors.

—— The Government Station, at Evergreen, Col., will probably be lighted by electricity.

—— The City Hall at Lowell, Mass., is now lighted by electricity in the interest of economy.

—— A company organized within the last month at Savannah, Georgia, will put in an electric light system at that place. Lights will be in operation by April 1st.

—— The selectmen of Holbrook, Mass., and representatives of the Thomson-Houston Electric Light Company, are locating the poles on all the streets in town, this week.

—— Bellefontaine, O., is agitating the electric light question. They claim that the gas is not sufficient to give the city light. They want electric light, and they want it bad.

—— The Northwest Electric Light Company of Winnepeg, Man., are busy making house connections, and hope to turn in the light in a few days. All the machinery is ready to start.

—— It is said that the Dedham Electric Light Company have invented a patent electric lantern, with fusible plug, by which the smallest blaze can be easily discovered in a building filled with smoke.

—— The machinery for the incandescent electric light plant purchased by the city of Vancouver from the Northwestern Electrical Supply Company, has arrived, and the plant will soon be in operation.

—— Elmira, N. Y., received another boom in electricity a few days ago, when the Westinghouse alternating plant there was increased to the extent of a new 750-light machine. This gives the plant a total capacity of 1,500 lights.

—— The employés at the Edison Electric Illuminating Company's works, at Lawrence, Mass., were recently given a banquet by their manager, L. E. Barnes, on the occasion of his marriage. The generosity and forethought of Mr. Barnes were appreciated by the employés.

—— The Electric Light Company of Washington C. H., O., expect to be ready to light the 31 additional street lights some time this week. They have their new dynamo in, but are waiting on some of the connections and have some of the wire to finish putting up.

—— Danielsonville, Conn., celebrated the first lighting of its streets by electricity, Thursday evening of last week, and is congratulating herself as having the finest plant in eastern Connecticut. The streets were full of people to see the lights. Boston parties control the plant.

—— Hughes & Gawthrop, agents of the Thomson-Houston Electric Company, in Pittsburgh, have closed a contract with the Wilkinsburg Electric Company for an electric light plant. The latter will consist of 1,300 incandescent and 30 arc lights. The contract is worth about $25,000.

—— The Bucksport Electric Company has been organized at Bucksport, Me., for the purpose of generating and distributing electricity for light and power purposes, with the following officers: President, John Post, Jr.; vice-president and general manager, F. S. Palmer; treasurer, Otis K. Stuart. The plant will have a capacity of 1,000 incandescent lights.

—— The business of the Westinghouse Electric Company, of Pittsburgh, Pa., in 1889, was the largest ever done by that corporation. The company has now 266 central stations in operation, both in this country and abroad, and 134 of this number were contracted for in 1889. These 134 central stations represent an aggregate capacity of 234,250 incandescent lamps.

New Work of the Eddy Motor Company.

A new form of motor has recently been brought out by The Eddy Electric Manufacturing Company, of Windsor, Conn., which embodies all the best features of the ring form, so well and favorably known upon the market. The high standard of workmanship established by this company has been maintained in every particular, and many of the details of construction are the same as in the ring form. The main difference is in the shape of the magnet. The idea and principle of the ring form has been preserved, while it has been so altered as to permit of winding it for high voltages, for which there is a growing demand. These motors are made reversible when desired, and will be adapted to any special class of work. Where it is necessary to have them mounted on a metal base, they are made just opposite to that represented in the illustration (Fig. 1), *i.e.*, just upside down.

In Fig. 2 is shown the new Eddy slow speed reversing motor in combination with the Holyoke safety elevator for freight and passenger service. With this combination, which occupies a floor or ceiling space two and one half feet by five feet, the amount of friction is reduced to a minimum, no belts, pulleys or countershaft being used, and with the most satisfactory results. For passenger service a speed of 200 feet or more per minute can easily be obtained. By the use of an Eddy reversing motor, which starts or stops with the elevator, the same smooth easy motion is secured as by the use of hydraulic power. The rachet wheel and pawl engaging with the same, acts as a positive stop for the car should the current fail or any or all gears be broken, and acts entirely independent of the operator.

The Eddy-Holyoke electric hoist is shown in Fig. 3. This electric hoist is very light, efficient and effective. It is well adapted to mine, dock and building work. It is made with both single and double drum. It is a first-class machine in every particular, and is guaranteed to give satisfaction. The Eddy Company is one of the most enterprising and progressive companies in the field, and its apparatus is efficient and popular. The success the company has won is well deserved, and the REVIEW wishes the company continued and increasing success.

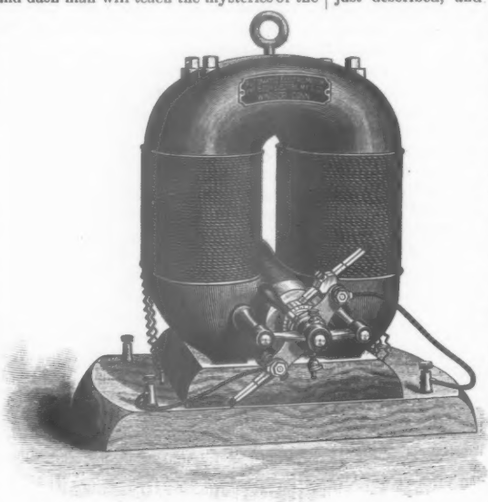


FIG. 1.—NEW FORM OF THE EDDY ELECTRIC MOTOR.

The "Plug" Operator.

"Where do they all come from?" is a question often asked relative to the numerous telegraph operators who daily keep the thousands of miles of wire busy throughout the world. And the question truthfully answered would be that they come from the farm and the school. To see the flashily dressed young man who presides over the country telegraph office and vends tickets and postage stamps to the village constituency, it would be hard to believe that two years previous he swore at a mule team while hauling rails to build a corn rick. Yet such is generally the fact. Many members of the profession may take umbrage at the statement, and it may be an injustice to some of them, especially to those employed by the commercial companies. These generally acquire their art while clerking in telegraph offices or acting as messenger boys. But it is to the railroad operator that it most refers.

The small country offices are generally supplied with a huge cannon stove, which is at all times kept red hot, regardless of the expense to the company. During the winter this station forms an excellent place for the farmer boys to loaf and keep the switch lights clean for the presiding genius of the station. As they gaze upon their own rough habiliments and then upon the raiment of the lightning jerker, they utterly forget the tenth commandment and covet his position. When they learn that the man with store clothes receives $10 per week for sitting around, reading novels, while they in summer must follow the plow and binder for $16 per month and "found," and in winter must feed the stock and chop cord wood for their feed only, down in the depths of their heart a yearning to master the art of sign communication grows strong. Finally a compact is made with the operator, by which the tiller of the soil agrees to transfer $5 per month to the purse of the telegrapher and to carry coal, sweep out the office and clean the lamps, in return for which the dot and dash man will teach the mysteries of the art to the lad. The contract made, bright and early the "plug" shows up. The floor of the office is swept clean, the lamp chimneys polished and the coal box filled to overflowing. A "local set" is put up and after the alphabet is duly memorized the task of murdering Morse is duly begun. The lad is now the envied one for miles around. For is he not learning to be an operator? The days, weeks and months roll by and spring sowing is at hand, but still the lad lingers at the musty little station with a piece of clip and a pencil copying the messages as they incessantly click by. Soon he is considered competent to take a train order, and now his proudest moment has arrived. After much labor he composes an application for a position, and being duly recommended by his tutor he is notified to hold himself in readiness for extra duty. Proudly does he exhibit this, his first official order, among his associates, who are now busy planting corn and harrowing the meadows. By and by the night man up the road goes to sleep and stops the fast mail. He is reported and receives a request to take a ten days' vacation. The new operator is called into requisition, and thus another operator has been launched upon the railroad world to compete with the thousands already in the business.

Finally, he drifts back to his old home and secures the place formerly held by his tutor. Very often he takes it at a lower rate of salary, and the following winter, instead of the student being taught, he undertakes to initiate all the farmer lads in that district into the mysteries of the dot and dash language. Soon he has manufactured enough "ham operators" to man a small railroad, while the man who taught him is back at home measuring calico, and selling sugar, wondering why it is so difficult to secure a position at his trade. Now, take all the country stations along the lines of the different railroads and average them with the one just described, and the great number of unemployed telegraphers who travel about the country on freight trains, sleeping in telegraph offices and trusting to the liberality of their more fortunate brothers, who have a situation, for their meals, are easily accounted for. At present the railroad men have formed an organization to curtail the production of "hams" and "plugs," yet it will take a very close organization to do away with the farm hand telegrapher.

The telegraph schools about the country are another source from which poor operators spring. These schools, which are run for revenue only, advertise largely in the country papers for boys and girls to learn telegraphy and take positions at once, paying $60, $70, $80, $90 and $125 per month. This advertisement is a delusion and a snare and intended to catch people with more money than brains. The boys and girls throughout the land read the attractive advertisement, and, being assured that they can learn the business in three or four months, pay the "principal" of the school $50, always in advance, and in return for it gain a meagre knowledge of telegraphy. The heads of these telegraph schools are generally poor operators, who are unable to hold a position and take this method of making money. A teacher in a school at Kansas City, at one time received a letter from one of his applicants in which the word telegraphy was spelled "tilligrafy" and said: "This is generally the class of students I have. So you see my school does not injure the profession much, as such people as that generally give the business up in disgust after a few weeks' study. I am in this business because I can make $300 per month out of it, when my abilities would not bring me in $50 per month on a railroad." The large salaries they advertise are the very highest paid, and are earned only by strictly expert operators, wire men and train dispatchers. The ordinary railroad operator receives $45 per month, which is but little more than the laborer on the section receives. But the telegraph schools turn out but few operators. Their students generally give up in disgust or manage to work themselves into an office, to perfect what little knowledge they have accumulated.

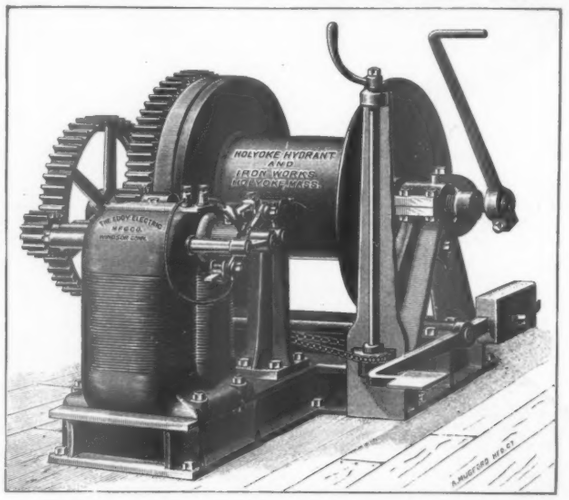


FIG. 3.—EDDY-HOLYOKE ELECTRIC HOIST.

An Electrically-Fed Horse.

A citizen of Spokane Falls, of an inventive turn of mind, concluded that it involved too much labor upon his part to rise early every cold morning and trot out to the barn to feed the family horse. So he purchased two tons of oats, had them placed in a bin over the horse's stall, and connected the manger and bin by means of a chute terminating in a hopper. To the hopper he attached a valve controlled by electricity, and so arranged that, when operated, a single feed of oats would run into the manger. He ran his wires into the kitchen, and connected them with a push button. The family were charmed with the arrangement, and quite envied him the pleasure of pushing the button and feeding the family pet.

After a few days, peculiar noises began to issue from the barn, and, upon investigation, poor Pegasus was found to be fairly swimming in about two tons of A1 oats. He was dug out, and the valve which worked so well was consigned to oblivion. It is with difficulty that the citizen can persuade his family to recognize him.

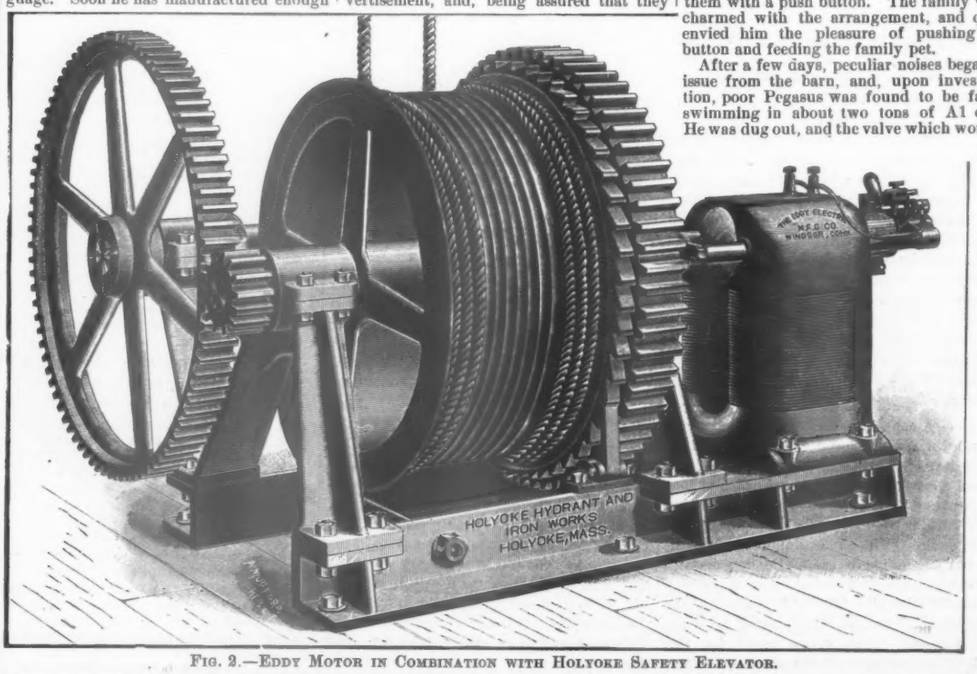


FIG. 2.—EDDY MOTOR IN COMBINATION WITH HOLYOKE SAFETY ELEVATOR.

Progress in the Supply Business.—The Central Electric Company, Chicago.

The old saying that a rolling stone gathers no moss, is not verified in the case of the Central Electric Company's several removals. Since their organization, this company have been phenomenally successful, and to-day are the happy occupants of one of the most thoroughly equipped supply houses in the country.

Realizing some time ago that the rapid growth of the company demanded more room, they set about finding a suitable building. Early in December, a building possessing the virtues of convenience and location was found at Nos. 116 and 118 Franklin street. A lease of this building was at once secured for a term of years, and preparations immediately made to remove. A large force of men were placed in the new quarters, and as a result the company moved into its present quarters January 13.

A casual observer, strolling down Franklin street, could scarcely fail to note the "Okonite" trade-mark conspicuously displayed on the front of the company's building, and it would hardly be necessary to read the large sign in gold letters or inspect the brilliant display in the windows, to know that he was at the headquarters of the energetic western agents of the Okonite Company.

The REVIEW representative called on the company a few days ago, and, after being greeted with a pleasant good morning by the members of the concern, was shown through the new establishment by Mr. F. W. Cushing, secretary of the company.

Leaving the private offices, on a tour of inspection, he enters the retail department—which is fully stocked with everything demanded by the business, from a package of sal ammoniac to the finest test instruments. Everything is systemized in this department, as it is throughout the building, each article having a place especially adapted for it. Directly in the rear of the above department, is the shipping and packing room, which is in connection with the wholesale department, containing the smaller or lighter goods, such as tape, bells, hard rubber goods, pushes, tools, etc.

Stepping on the elevator, power for which is supplied by a five horse-power motor, the ascent is made to the upper floors, which are fully stocked with the heavy goods—wire, insulators, etc.—each size and kind of wire and each style of insulator having separate bins, which not only enables the shipper to place his hand on any desired article, but shows what stock is needed.

In the basement is stored car-loads of cross-arms, pins, brackets, insulators and submarine cables. Here, as well as elsewhere throughout the building, every facility is at hand for handling goods. All heavy freight is received in the freight chute in the front of the building, while the light freight and express packages are received in the rear.

Electric lights, call bells and speaking-tubes are used on all floors.

At the present writing, the company employ about 40 hands, 25 in the Chicago office and 15 in their pin and bracket factory, at Columbia City, Ind.

The retail department, main office and private offices, are finished throughout in polished cherry, while bright rugs adorn the inlaid hard-wood floor. The stock throughout is large and varied, while the fittings of the building are the acme of perfection.

An excellent view of the new quarters of this company is presented on this page.

The Trinidad-Heimann Insulated Wire Company.

The above company has purchased the manufacturing plant of the Callender Insulating and Waterproofing Company at Harrison, N. J., and added to it the latest improvements in machinery for covering wire with insulating material. A specialty will be made of the Trinidad insulated wire, which is well-known, and is considered by those that have used it to be one of the best waterproof wires in use.

The company has also bought the Heimann patents for fireproof insulation. This wire is thoroughly fireproof. The weatherproof material can be burned off, and the fireproofing, which is next to the wire, will still have, we are informed, an insulation resistance of 8,000,000 ohms to a mile.

The manufacturers state that the weatherproofing material on the Heimann wire is the same as that on the Trinidad wire, and that as a fireproof insulated wire for carrying high electrical currents, the Heimann is a very superior wire.

An Electric Car Episode.

A BOSTON GIRL AS A GOOD SAMARITAN.

It was just at dusk and in a gloomy section of the street, and the electric car was rapidly approaching, its bell ringing rapidly in sharp, quick peals of warning, and the light in its front gleaming like a great fiery eye as it came on, says the funny man of the *Commercial Bulletin*. Miss Tendrart stood on the curbstone waiting to cross, when she noted a round-shouldered old man groping forward with stick in hand, apparently cautiously feeling his way.

"A blind man!" gasped Miss T., "and he will be killed; will nobody save him?"

She looked wildly to the right and left, but no one of the male persuasion was within call. She shouted frantically to the poor blind man to come back, but he plodded on unheeding. He had just reached the track; the fiery-eyed monster was approaching and would stretch him a mangled corpse on the pavement. Not a moment was to be lost. Wild with terror and excitement she rushed forward, and, frantically throwing her arms about him as he stood there fumbling with his stick upon the very edge of the track, drew him back with desperate energy just as the car rushed past them, and the man, struggling in her grasp, turned fiercely and demanded:

"W'at d'yer mane, squeezin' the life out o' me and draggin' me 'round? Sure ye ought to be ashamed, the likes of a lady like ye."

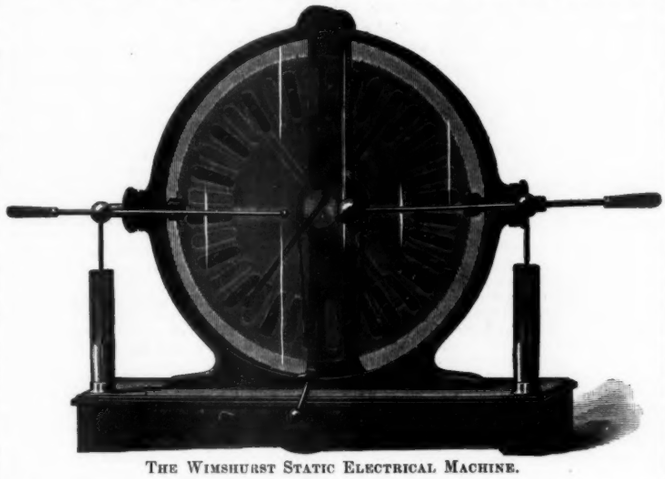
"Oh! my poor blind man. You are saved," gasped Miss T.

"Saved? Sure I'm glad I'm saved, but who's callin' me blind, wid a pair of eyes I have shinin' like a cat's in a dark cellar."

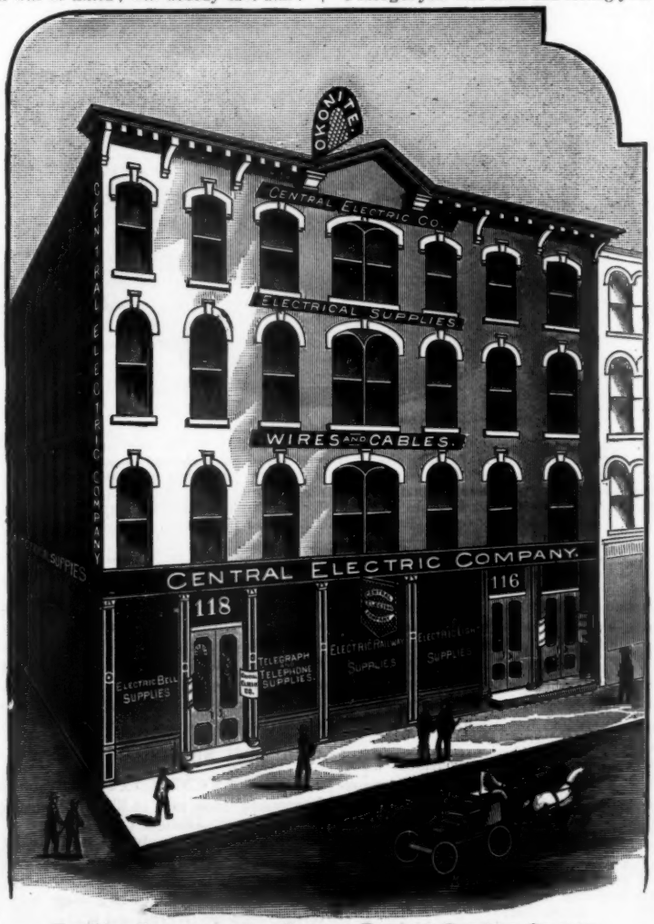
"But," stammered the female Samaritan, "I thought you were blind and feeling your way across the street with your stick, and would be run over."

"Wid me stick," said the man, looking at his iron-pointed staff. "Why, it's the switch-man I am, miss, and it's to push the rail and switch the car to the turn-out that me stick is for."

There was a subdued snicker in the little group that had gathered, and as the next car just then pulled up, Miss T. got in to avoid further explanation of the switch-man respecting the interruption of his duties.



THE WIMSHURST STATIC ELECTRICAL MACHINE.



THE NEW BUILDING OF THE CENTRAL ELECTRIC COMPANY, CHICAGO.

The Wimshurst Static Electrical Machine.

The machine of which we present an illustration comes to us as one of the latest and most compact influence machines on the market. Its essential parts are two glass disks placed close together, on which are fixed an equal number of tinfoil sectors, and made to revolve in opposite directions by belts and pulleys operated by the cranks, as shown in our cut.

The revolving plates are enclosed between two stationary glass disks, which are set into the frame of instrument, and protect the generating plates from mechanical injury, condensing of moisture, and accumulation of dust.

The Wimshurst is conceded to be the least effected by change of temperature of any form of static machine yet made.

The accumulation of its charges is rapid and the spark is of good length and quality.

This form of machine is particularly adapted for experimental purposes, flash light gas lighting, and is coming into successful use in the treatment of many nervous diseases.

The design of the machine is original and unique, and with the cherry frame and polished brass works, presents a very pleasing appearance.

The Electrical Supply Company, of Chicago, are introducing and handling this instrument.

A Question of Contract.

A special from Topeka, Kan., states that an application for a receiver for the Topeka Rapid Transit Railway Company, and suit for the foreclosure of a mortgage, was filed in the United States Circuit Court on the 25th of January, by the Thomson-Houston Electric Company, of Boston. The Metropolitan Trust Company of New York, is also made a party defendant. It is claimed that the railroad company contracted for the electrical equipment of its road and agreed to pay $186,000 in its first mortgage bonds to the Thomson-Houston Company; that that company has carried out its part of the agreement; that by an arrangement with the Metropolitan Trust Company, of New York, first mortgage bonds in the sum of $600,000 were issued by the railway company and a trust deed of the property issued as security; that the Thomson-Houston Company has received only $10,000 worth of bonds, and the interest on this sum has not been paid. The plaintiff asks for the delivery of the $186,000 worth of bonds, and in the case of default, that the railroad be sold or placed in the hands of a receiver.

The company's officers say the bonds will be delivered when the Thomson-Houston Company fulfils its contract regarding equipment, and that their interest on $100,000 is on deposit with the Metropolitan Trust Company, but no coupons have been presented against it.

More Electric Railways.

The mid-winter is not generally considered by street railway construction companies to be the most active and busy time of the year. The conditions of soil and weather are unfavorable for outside work, and the amount of business to be performed by the street railway companies is not so great as in the summer months, and does not encourage extensions. But with the prominent electric railway supply companies, the season seems to have no effect upon the amount of business contracted for and under construction, unless it is to increase it. We are advised by the Sprague Electric Railway and Motor Company that winter makes no difference with its business, and that during the last few months an unusually large number of contracts has been closed for electrical apparatus, and that construction work will go on right through the winter.

A list of the roads which have ordered equipments from this company illustrates in a striking way the remarkable confidence which street railway managers feel in the electric system, and is indicative of a wide-spread adoption throughout the country by street railway companies of electrical apparatus. Among the most recent contracts of the Sprague Company, may be mentioned the following: Salem, Ohio, Capital City Street Railway, 2 cars; Davenport, Ia., Electric Street Railway Company, 4 cars; Dubuque, Ia., Electric Light and Power Company, 10 cars; Chicago, Ill., Cicero and Proviso Street Railway, 12 cars; and the following additional orders from street railway companies already equipped by Sprague or other systems: Sioux City, Ia., Sioux City Electric Railway, 3 cars; Milwaukee, Wis., West Side Street Railway, 9 cars; Des Moines, Ia., Des Moines Electric Railway, 2 cars.

KINDRED INTERESTS

Messrs. H. M. Sciple & Company, agents of the Ball Engine Company, are just starting up one of their 100 horse-power tandem compound engines at the station of the Edison Electric Illuminating Company, of Lebanon, Pa.

Messrs. Chas. R. Vincent & Company, 15 Cortlandt street, New York City, agents of the Ball Engine Company, have just delivered a 35 horse-power engine to the Brooklyn Navy Yard, for the new electric light installation.

Young's Automatic Safety Cut-Out is meeeting with the favor to which it is entitled. The Royal Electric Specialty Company, 239 Water street, New York City, are handling this device and they report that they have orders for the cut-outs from several of the large electric light companies, which they will fill as soon as it is possible to obtain the cut-outs.

The Thomson-Houston Electric Company reports the following sales of arc apparatus to central stations: Franklin, Tenn., 20; Butte, Mont., 30; Rochester, N. H., 105; Kokoma, Ind., 70; Bedford, Ind., 50; Long Branch, N. Y., 100; Wilkesbarre, Pa., 50; Lowell, Mass., 25; Atlanta, Ga., 50; W. Superior, Wis., 50; Martin's Ferry, O., 20; Johnstown, Pa., 50; Hyde Park, Mass., 50; Spokane Falls, Wash., 50; Petaluma, Cal., 50; Omaha, Neb., 100; Denver, Col., 70; Richmond, Mo., 15; Joliet, Ill., 35; Nashville, Tenn., 300; Mt. Clemens, Mich., 30; Cheboygan, Mich., 30; Bluffton, Ind., 50.

The Westinghouse Electric Company received orders for arc lighting apparatus from the following places during January; Allegheny County Light Company, Pittsburgh, Pa., 125; Salem, Ohio, 20; Oldtown, Me., 35; Uxbridge, Mass., 20; Boston, Mass., 653; New York, N. Y., 125. Also the following orders during January for central station plants, alternating current apparatus: Jacksonville, Ill., 750; Allentown, Pa., 1,500; Elmira, N. Y., 750; Red Oak, Iowa, 750; Gouverneur, N. Y., 750; Uxbridge, Mass., 750; London, England, 15,000; Sacramento, Cal., 1,500; Hampton, Va., 750.

The Eclipse Wind Engine Company, Beloit, Wis., have nearly completed an addition of 72 feet to their machine shop, and of 64 feet to their foundry, which will make the former 270x70 feet and the latter 194x72 feet. These enlargements fitted up with traveling cranes and new machinery, will enable the company to meet with promptness the increasing demands for friction pulleys, rope sheaves, stands, shafting, etc., The works are now engaged night and day, upon outfits for the new Thomson-Houston Electric Light and Power Company, Omaha, the Union Railroad Depot, St. Louis, and others of lesser note.

The Thomson-Houston Electric Company reports the following sales of arc and incandescent apparatus for isolated plants: Cumings & Keltron, Macomb, Ill., 30 arc; W. D. Sheldon, Saylesville, R. I., 12 arc; Bouton & Co., Auroria, Ill., 9 arc; Joliet Enterprise Co., Joliet, Ill., 18 arc; Sears Building, Boston, Mass., 200 inc.; J. S. Davidson, N. Y., 200 inc.; L. Prang, Roxbury, Mass., 400 inc.; R. Bishop & Co., So. Boston, Mass., 200 inc.; P. Steam Packet Co., Portland, Me., 200 inc.; Geo. F. Blake Man. Co., E. Cambridge, Mass., 400 inc.; Standard Sugar Refining Co., So. Boston, Mass., 800 inc.; Hathaway Building, Boston, Mass., 400 inc.; J. A. Frye, Marlboro, Mass., 400 inc.; Soldiers' Home, Chelsea, Mass., 400 inc.; E, Ellsworth, Chicago, Ill., 50 inc.; Fort Worth *Gazette*, Fort Worth, Tex., 100 inc.; Miller & Phelps, Fort Dodge, Ia., 20 inc.; Golden Eagle Mill Co., Petaluma, Cal., 50 inc.; Rowes Malt Works, Waukegan, Ill., 200 inc.; A. P. Gilmore, Chicago, Ill., 350 inc.

The Baxter Electric Motor Company, of Baltimore, has just been incorporated as the successor of The Baxter Electric Manufacturing and Motor Company, whose property and assets it has purchased. Its board of directors embraces some of Baltimore's wealthiest as well as most successful business men, one of whom, Mr. Edward G. Hight, is its president, which fact, together with the strong financial backing it has, and its having secured the services of David E. Evans, to place the company on a proper manufacturing basis, is a guarantee that the interests of the company will be properly guarded. The Baxter Motor is too well known throughout the country, to need further public notice, but we hasten to add, that a number of most valuable inventions covering an entire and perfect power plant, will be at once placed before the electrical interests of the country, which will produce little short of a revolution in electrical power and transmission. Without going into detail we will take the liberty to call attention to our electrical elevator (passenger and freight) generator with running outfit complete; street railway motors and car trucks, and in fact everything which can be covered under the generic name of electric power. The immense shops in East Baltimore will be re-opened and a full force of skilled mechanics employed, so that no delay will occur in filling orders from our old or new correspondents. We respectfully ask that inquiries be at once instituted by all those interested in power matters, so that we may make good all claims set forth in this circular. (Signed) BENSON M. GREENE.

NEW DISTRICT CALL BOX.

A New District Call Box.

In the business of a district telegraph company (like that of any other business), faults and troubles will arise, the most fruitful source of which is the subscriber himself. Not every one is born an electrician, neither is every one born a mechanic, but many people seem born to find fault with the matters and things with which they are brought in contact.

To be successful, any business which deals with the general public must be popular, and, in order to be popular, must be able to meet every requirement of an over-exacting people. To avoid the little annoyances which have been occasioned by the old patterns of district telegraph boxes, a new box has been recently patented and placed on the market.

The chief characteristics of this box is a series of push buttons, the name of a "want" being printed on each button, and the principle on which it works is that of a divided circuit. It contains the ordinary mechanism of a district telegraph box, having but one commutator wheel with the notches in its periphery corresponding to the number of the box, and ten notches to correspond with the ten different wants. At a given point in the revolution of this commutator wheel, which corresponds to the relative position of each push button, the brush may be shunted. Hence, the number of dashes will be sent in which will correspond with the button which has been pushed down. The box is so constructed that when one button is pushed in, any and all other buttons which may be pushed in at that time, will be released and returned to their normal position. It is next to impossible for a mistake to occur on this box, for a person has but to put his finger on the button on which his want appears, and press it down.

The return signal on this box is very simple, yet complete. There are two windows, at one of which will appear (when the box is in working order) the words "in order." When the signal has been sent in, the operator at the central station, by pressing a double contact button, breaks the circuit, depriving the line for an instant of all current. This causes to appear in the other window in every box on that line, the word "answered," which remains in the window for an instant, and then disappears, the words "in order" appearing at the other window. This notifies the one who sent the message, and all others on that line, that a certain call has been made, and has been understood. This makes the box practically non-interfering, as, when any box is in use, the indicators in all the other boxes will be moving. The answer back is given in all the other boxes, after which the box will show the words "in order." Then any other subscriber who may have been waiting will know that the line is in order and can be used.

The mechanism which short circuits the box is simply a small brush attached to each push bar. This brush, when the bar is pushed in, is held down to such a position that, when the proper place on the commutator wheel shall have reached the brush, it will make a contact that will short circuit the breaking mechanism.

The pushes on the box are made large enough to have the entire wants spelled if necessary. This box was patented January 7, 1890, and is now being put on the market by the Monitor Electric Company, Chicago, Ill., G. A. Harmount, manager.

Large Factory Facilities.

THE OWNERS of a large, modern manufacturing establishment in central New York, have business which occupies the plant for a part of the year only. They would be glad to undertake the manufacture of

Electrical Apparatus, Dynamos, MOTORS

Or any Appliances used in Electric Lighting or for Traction Purposes,

for parties who may not have sufficient facilities for present orders. Capacity of the foundry, thirty tons of casting per day, which can be increased if desired. Machine shop well equipped with modern machinery and capacity for employing 150 to 200 men.

This factory is exceptionally well located for receiving supplies and for getting low rates of freight both east and west.

Correspondence addressed to "ELECTRIC," care of Editor ELECTRICAL REVIEW, will receive prompt attention.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON FEBRUARY 4, 1889.

420,444 Thermal cut-out; Geo. Farrell, New York, N. Y.
420,469 Regulation of electric motors; Lemuel W. Sewell, Plainfield, N. J., and Harvey L. Lufkin, New York, N. Y.
420,500 Electric drill; Imle E. Storey; Boulder, Col.
420,543 Electric street car gear. 420,544 Electric car gear. 420,545 Electric car axle; Edgar Peckham, New York, N. Y.
420,552 Extension-electrolier; James E. Brown and John F. Brown, Brooklyn, N. Y., assignors to the Archer & Pancoast Manufacturing Company, of New York.
420,594 Quadruplex telegraph; Thos. A. Edison, Menlo Park, N. J., assignor to the Western Union Telegraph Company, New York, N. Y.
420,611 Electric brush; John E. Stephens, Cincinnati, Ohio.
420,622 Electrical lock switch; Edward N. Dickerson, Jr., New York, N. Y.
420,635 Staple for electrical conductors; Luther Stiemiger, New York, N. Y.
420,641 Method of electric refrigeration; Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place.
420,693 Electro-magnetic car brake; Daniel S. McElroy, New York, N. Y.
420,705 420,706 Electric lamp adapter; James Stewart, New York, N. Y., assignor of one-half to Edmund C. Stanton, same place.
420,718 Separator; David Cochrane, Philadelphia, Pa.
420,740 Electric belt; Albert J. Sheffield, Griggsville, Ill.
420,762 Electric meter; James D. Bishop, Chicago, Ill.
420,764 Thermo-electric generator; Chas. S. Bradley, Yonkers, N. Y.
420,804 Conduit for electric railways; Delbert E. Johnson, Atlanta, Ga.
420,816 Electrically reciprocated tool; Harry N. Marvin, Syracuse, N. Y.
420,833 Autographic telegraph; James H. Robertson, Brooklyn, assignor to the Writing Telegraph Company, New York, N. Y.
420,834 Electric door opener; Geo. A. Seib, New York, N. Y., assignor of one-half to Otto Starke, same place.
420,840 Electro-magnetic abdominal support; Mary E. Thomas, Cardington, Ohio.
420,850 Electrical recording instrument. 420,851 Method of electrically recording signals. 420,852 Apparatus for electrically recording signals; Frank B. Wood, New York, N. Y., assignor to the E. S. Greeley & Company, of Connecticut.
420,858 420,859 Electric railway signal; Geo. W. Boss, Minneapolis, Minn.
420,881 Filament for incandescent lights; Rudolf Langhans, Berlin, Germany.
420,882 Electric regulating mechanism; Hermann Lemp and Meile J. Wightman, Hartford, Conn., assignors to the Schuyler Electric Company, of Connecticut.
420,884 Multiple telegraphy; Ernest J. P. Mercadin, Paris, France.
420,890 Electric time alarm and indicator; Chas. A. Randall, London, England.
420,906 Apparatus for charging and discharging secondary batteries; Warren S. Johnson, Whitewater, assignor of one-half to William Plankinton, Milwaukee, Wis.
420,911 Lubricator; William P. Miller, Brooklyn, N. Y., assignor to the William P. Miller Company, same place.
420,921 System of generators; Addison G. Waterhouse, Hartford, Conn., assignor to the Westinghouse Electric Company, Pittsburgh, Pa.

WANTED by one of the largest firms of **Manufacturing Electricians in Great Britain,** particulars and details of **First-Class Ammeters and Voltmeters** of which they are desirous of taking up the manufacture in England on a royalty, or as may be otherwise arranged. The instruments offered must be of exceptional quality and design.

Reply to **X. Y.,** care of **W. M. WILLS, 151 Cannon Street, London, England.**

EXAMINATION OF INSPECTORS.

AN OPEN COMPETITIVE EXAMINATION of applicants for appointment under the Board of Electrical Control as Inspectors of Electrical Conductors and Inspectors of Underground Construction, will be held at Room 21, Cooper Union, New York City, on Tuesday, February 11, commencing at 10 o'clock, A. M.

Also at the same hour and place applicants for appointment as Interpreters. Candidates must be residents of the State of New York. Blank applications and other information may be had by addressing the Secretary of the Civil Service Commission, Albany, N. Y.

JOHN B. RILEY,
Chief Examiner.

Albany, N. Y., Jan. 30, 1890.

ELECTRIC SECURITIES

EXCLUSIVELY.

We offer For Sale, and can RECOMMEND

Bonds, 1st Mortgage, Netting, } 6%

Stocks, Preferred, Netting, } 7%

STOCK OF ALL ELECTRIC LIGHT AND WELDING MANUFACTURING COMPANIES.

Conservative investors will do well to correspond with us, and learn of what we have to offer. We devote our entire attention to ELECTRICS.

R. D. WILSON & CO.,
113 DEVONSHIRE ST., Room 21, BOSTON.

WANTED.—Manufacturers to know that we will give free site, with right to purchase lands adjoining, to responsible manufacturers who will locate with us. This land is situate along the main line of Penna. Railroad, in Westmoreland County, Pa., 28 miles from Pittsburgh (all shipping rates same as Pgh.), in the heart of the Great Natural Gas Belt, adjacent to gas and water mains; is all underlaid with coal.
Address
ENTERPRISE LAND COMPANY, GREENSBURG, PA.

CINCINNATI, O., No. 11 HAMMOND B'LD'G,
THOS. G. SMITH, Jr., M. E.
Steam and Electric Power Construction; Electric Light Plants; Consultation and Superintendence; Specifications furnished for first-class plants.

ELECTRICAL CONTRACT WORK.
DETAILED ESTIMATES MADE AND CONTRACTS TAKEN
— FOR —
EQUIPMENT
— OF COMPLETE —
STEAM AND ELECTRICAL PLANTS
— ANY SYSTEM OF —
ARC AND INCANDESCENT LIGHTING,
CENTRAL STATIONS
AND ELECTRIC STREET RAILWAYS OPERATED OVERHEAD, UNDERGROUND, OR BY STORAGE BATTERIES.
— ADDRESS —
EUGENE T. LYNCH, Jr., Consulting Engineer,
120 Broadway, New York.

ELECTRIC CONDENSER
WM. MARSHALL, MANUFACTURER.
Standards a Specialty
Rooms 2 and 4, University Building, New York.

ROYCE & MAREAN,
DEALERS IN
ELECTRICAL APPARATUS
Telegraph and Telephone Supplies,
No. 1408 Penna. Avenue,
Opp. Willard's Hotel. WASHINGTON, D. C.

Sperry Electric Company,
Factory 195-207 Canal Street, Chicago, Ill.
MANUFACTURERS OF THE
Improved Sperry High and Low Tension Systems of Arc Lighting,
Claiming the Highest Efficiency, Reliability and Durability. Perfect Regulation.

ELECTRICAL MEASUREMENT
Instruments and Batteries of the Very Highest Grade.
Precision and Constancy, Quality and Finish the Best in the World.
Catalogue of Standard Test Instruments furnished upon application.
THE E. S. GREELEY & CO.,
5 AND 7 DEY ST., NEW YORK.

PATENTS.
Electrical Review Patent Bureau
Conducts a general business in the preparation and prosecution of Applications for Patents in the United States and all Foreign Countries. All business carefully and promptly attended to in the matter of Reissues, Caveats, Trade Marks, Labels, Design Patents, Copyrights.
SPECIAL SEARCHES made to determine the question of novelty or infringement.
ELECTRICAL PATENTS A SPECIAL FEATURE.
Address,
Electrical Review Patent Bureau,
13 Park Row, N. Y. T. J. McTIGHE, Manager.

Girard Building, Broad & Chestnut Sts.
PHILADELPHIA.

EUGENE F. PHILLIPS, PRESIDENT. W. H. SAWYER, SEC. & ELECTRICIAN.
AMERICAN ELECTRICAL WORKS,

Manufacturers of Patent Finished
ELECTRIC LIGHT WIRE,
MAGNET WIRE, OFFICE & ANNUNCIATOR WIRE,
RUBBER COVERED WIRE, LEAD ENCASED WIRE,
TELEPHONE & INCANDESCENT CORDS.
FARADAY CABLES.
Office and Factory, 67 STEWART STREET., PROVIDENCE, R. I.
New York Office, 18 Cortlandt St., P. C. Ackerman, Agt.

EUGENE F. PHILLIPS, PRESIDENT. JOHN CARROLL, SEC'Y-TREAS.
EUGENE F. PHILLIPS ELECTRICAL WORKS, LTD.
Manufacturers of

ELECTRIC LIGHT WIRE,
MAGNET WIRE, OFFICE & ANNUNCIATOR WIRE,
RUBBER COVERED WIRE, LEAD ENCASED WIRE,
TELEPHONE & INCANDESCENT CORDS.
FARADAY CABLES.
OFFICE AND FACTORY, St. Gabriel Locks, MONTREAL, CANADA.

HYDRAULIC PRESSES.
ALL VARIETIES.
PUMPS, VALVES, GAUGES AND FITTINGS,
PUNCHES, SHEARS, BUFFING MACHINERY, &c.
WATSON & STILLMAN,
210 EAST 43D STREET, NEW YORK CITY.
Special Attention to Electrical Work.

W. R. OSTRANDER & CO.
21, 23 & 25 ANN ST., NEW YORK,
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS, Electric & Mechanical Bells,
FACTORY,
De Kalb Avenue, BROOKLYN.
Send for Illustrated Catalogue.

INSULATOR BATTERY JARS.
WE ARE HEADQUARTERS.
SHAY, STEPHENS & CO., CHICAGO.

PORCELAIN AND GLASS.

SEND FOR CATALOGUE.
THE WYCKOFF PIPE CO.,
MANUFACTURERS OF
WOODEN PIPES FOR
UNDERGROUND ELECTRICAL WIRES.
We have large works for creosoting Lumber, R. R. Ties, Telegraph Poles, &c., &c.
WILLIAMSPORT, PENN.

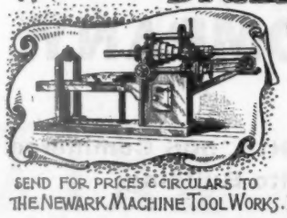
STANDARD ELECTRICAL TEST INSTRUMENTS.

Ayrton & Perry Ammeters and Voltmeters,
Carpentier Ammeters and Voltmeters,
Cardew Voltmeters, Electro-dynamometers,
Queen's New Standard Laboratory Resistance Boxes,
Queen's New Portable Combination Testing Sets,
Complete Outfits for Insulation Testing.
SPECIAL ATTENTION PAID TO RECALIBRATING AMMETERS AND VOLTMETERS.
JAMES W. QUEEN & CO., 924 Chestnut Street, PHILADELPHIA.

SILKS.
Full assortment of different sizes and qualities on BRAIDER SPOOLS, ready for the machines, in Red, Yellow and Green. Other colors to order. Send for Sample and Prices.
WM. MACFARLANE & CO., 55 Mercer Street, New York.
Telephone No. 971 Spring. Mill, Bergen Point, N. J.

Fuse Wire! Fuse Wire!
Accurately Determined. Carefully Made by a new Process. For Sale by
W. H. GORDON & CO.,
ELECTRIC LIGHT AND POWER SPECIALTIES,
Send for Catalogue. 115 BROADWAY, NEW YORK.

THE CLARK
ARC LIGHTING SYSTEM
Is the Safest and Most Economical in the United States.
Manufactured by the CLARK ELECTRIC CO., 192 Broadway, N. Y.

Horizontal DRILLING AND BORING MACHINE

Reversible
SELF-ACTING
Feeds from $\frac{1}{60}$ to $\frac{1}{4}$ of an inch
SEND FOR PRICES & CIRCULARS TO
THE NEWARK MACHINE TOOL WORKS, Newark, N.J.

HIGHEST AWARD,

PARIS EXPOSITION, 1889.

THE ONLY GOLD MEDAL
Awarded for Electric Batteries.
TRADE GONDA MARK.
The Standard Open Circuit Batteries of the World,
AND THE BEST.
THE LECLANCHÉ BATTERY CO.,
149 West 18th Street, New York.

THE EDDY

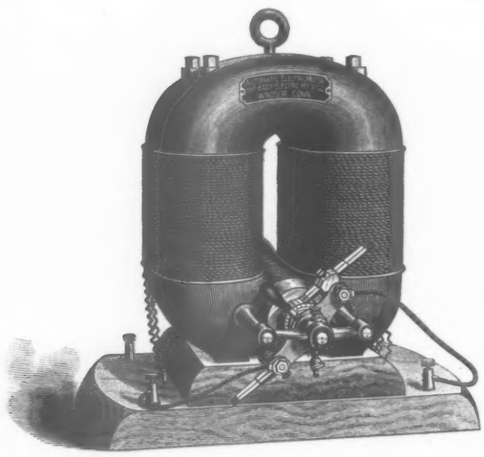
AUTOMATIC ELECTRIC MOTOR

IS

Made in all Sizes from ½ H. P. Upwards.

It is of the Highest Efficiency, and the Quality of Material and Workmanship is Unsurpassed.

IT IS WOUND FOR CONSTANT POTENTIAL CIRCUITS ONLY.



Special Motors designed when necessary to suit different classes of work.

ELECTRIC ELEVATORS,

With Reversing Motor connected to Hoisting Machine direct.

MINING, BUILDING AND DOCK HOISTS.

ALL WORK GUARANTEED.

For further information, address

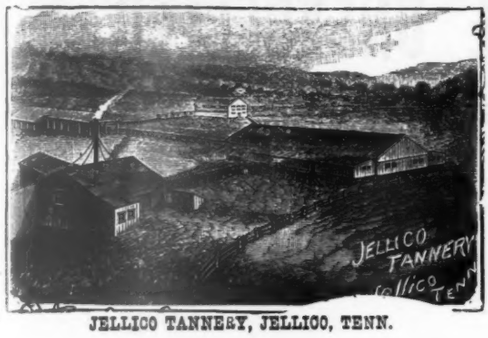
THE EDDY ELECTRIC MFG. COMPANY,

WINDSOR, CONN.

NEW YORK, 33 Church St. BOSTON, 111 Arch St. PHILADELPHIA, 506 Commerce St.
NEW ORLEANS, 106 Carondelet St. KANSAS CITY, Rialto Building.
DENVER, 1534 Lawrence Street.

JEWELL BELTING CO.

Hartford, Conn.



JELLICO TANNERY, JELLICO, TENN.

MANUFACTURERS OF

SHORT LAP, PURE OAK
LEATHER BELTING.

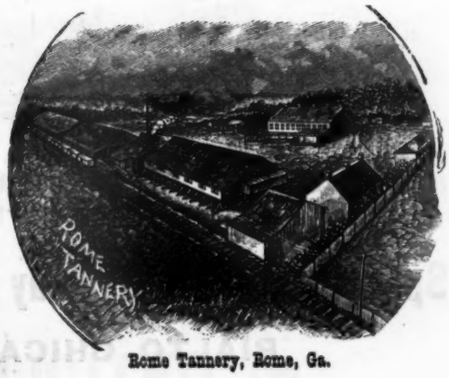
BELT FACTORY, HARTFORD, CONN.

LIGHT DOUBLE DYNAMO BELTS

ARE ALWAYS MADE FROM

CENTERS OF WHOLE HIDES

EXTRA STRETCHED.



Rome Tannery, Rome, Ga.

Durable, Efficient, Economical and Convenient.

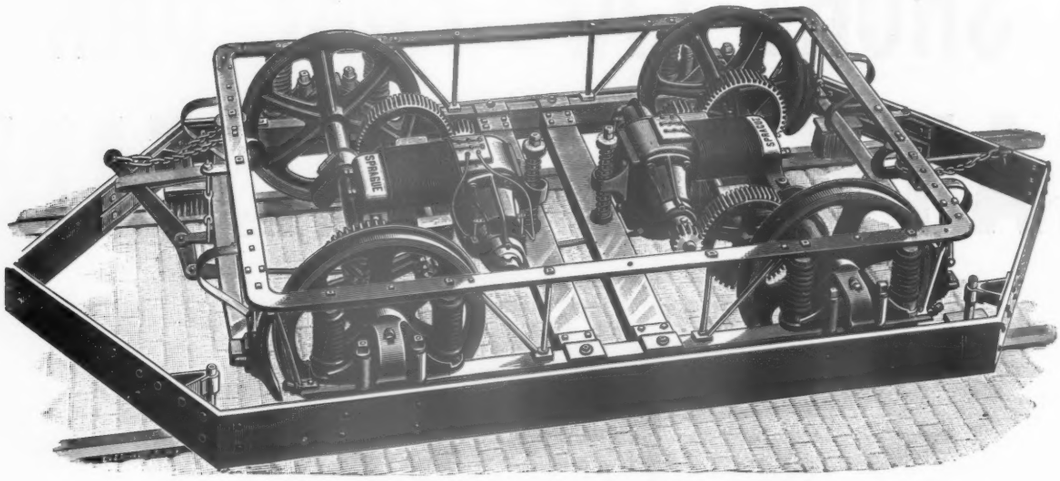
THE SPRAGUE MOTORS ARE UNEXCELLED

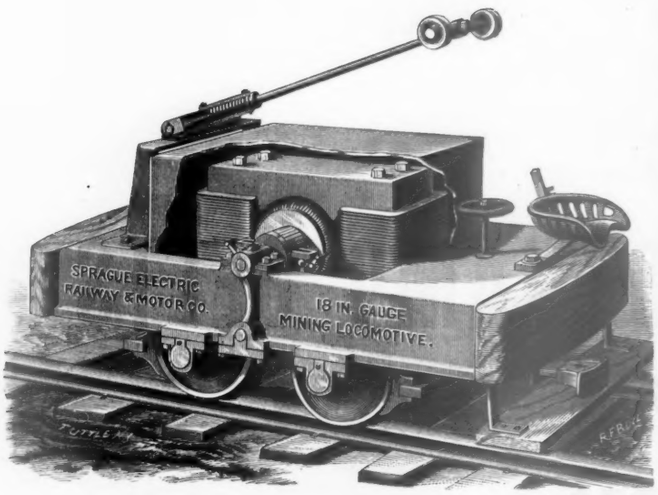
FOR

STREET RAILWAYS, MINING WORK

AND

GENERAL INDUSTRIES.



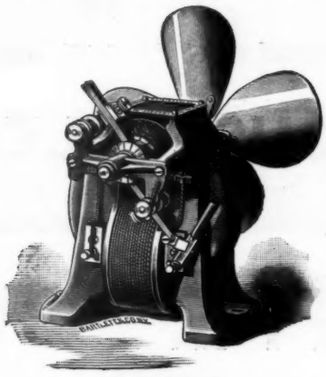


SPRAGUE ELECTRIC STATIONARY MOTORS ARE IN USE IN MORE THAN ONE HUNDRED AND FIFTY DIFFERENT INDUSTRIES.

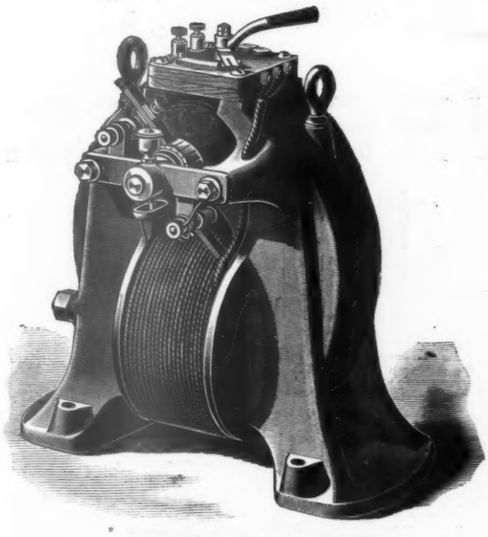
Sprague Electric Railway and Motor Co., 16 & 18 Broad Street, New York.

RIALTO, CHICAGO, AND ALL COMMERCIAL CENTERS.

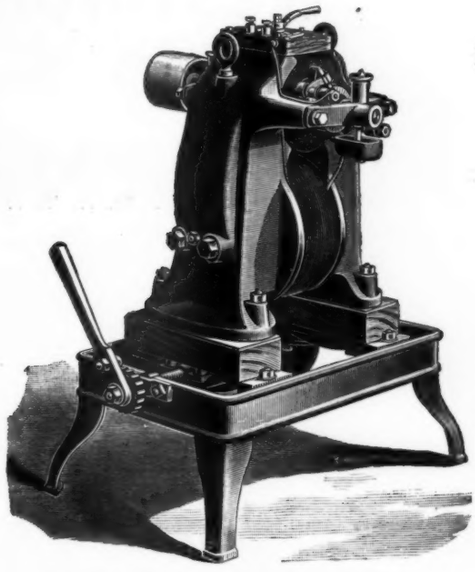
Electric Motors and Generators



FAN MOTOR.



MOTOR WITHOUT BASE.



MOTOR WITH ADJUSTABLE BASE.

The United States Electric Lighting Company,

[WESTINGHOUSE ELECTRIC COMPANY, Lessees.]

EQUITABLE BUILDING, NEW YORK.

Manufacturers of Direct Current Generators and Motors for all purposes, from one-eighth H. P. Fan Motor up to any size and of any Electro-Motive Force required.

Generators and Special Motors for Travelling Cranes, Elevators and Mining Purposes.

This Company will furnish apparatus of its own designs or will make Motors to Purchaser's Specifications for General Power Distribution and for Electric Railway Cars.

The special form of Motor made by this Company is superior in design and workmanship, and unequalled in efficiency.

⋖ CORRESPONDENCE SOLICITED. ⋗

THE

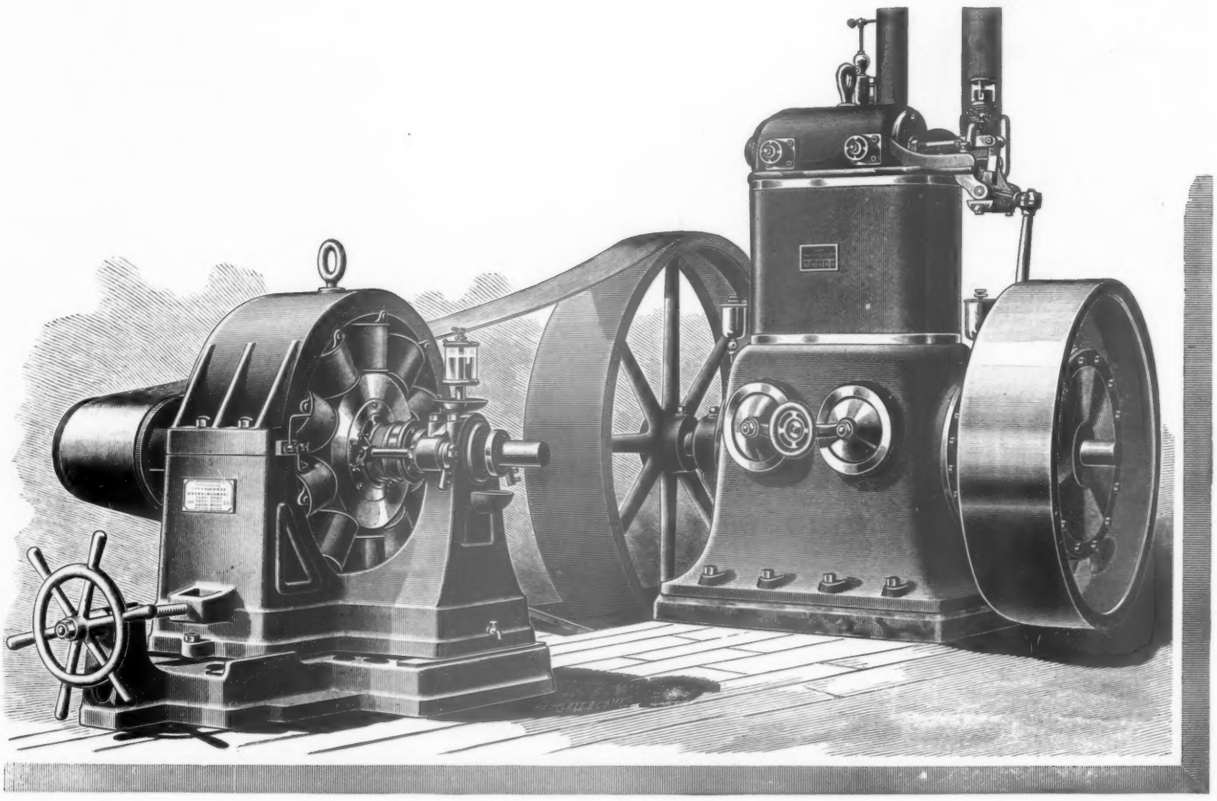
Incandescent Lighting System

OF THE

WESTINGHOUSE ELECTRIC CO.,

BY

ALTERNATE CURRENTS.



Dynamos for 500 to 5,000 Sixteen Candle-Power Lamps Capacity

COMPLETE CENTRAL STATION MACHINERY.

THE WESTINGHOUSE ELECTRIC COMPANY,

Pittsburgh, Pa., U. S. A.

Boston, New York, Chicago, Cincinnati, St. Louis, Portland, San Francisco, Charlotte, Dallas.

POWER USERS

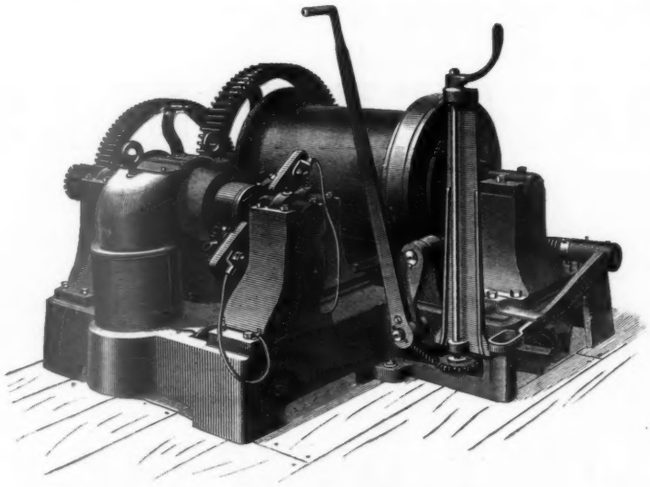
SHOULD INVESTIGATE THE MERITS OF THE

THOMSON-HOUSTON SYSTEM

FOR THE

ELECTRICAL TRANSMISSION OF POWER.

MOTORS FROM 1 TO 100 HORSE-POWER.



15 H. P. ELECTRIC HOIST.

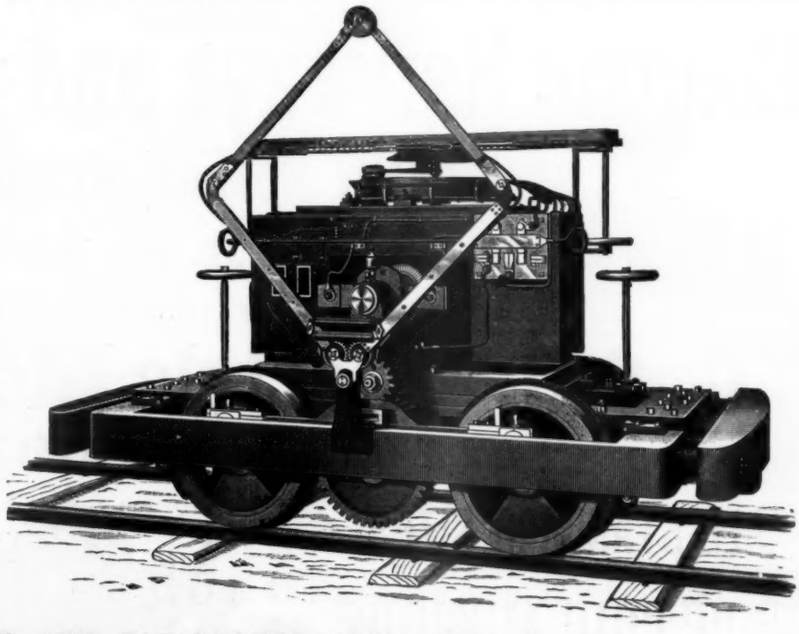
Electric Motors for operating Pumps, Shops, Drawbridges, Turntables, and for use wherever power is required.

Electric Hoists and Special Apparatus for Building and General Engineering Operations.

AUTOMATIC GENERATORS OF CAPACITIES FROM 10 to 85 HORSE POWER.

Estimates furnished for the complete Equipment of Mining Tramways for Surface or Underground Haulage.

The accompanying cut shows the 40 H. P. Mining Locomotive designed for and now used by the Hillside Coal Company, at the Erie Colliery, Scranton, Pa.



FOR ESTIMATES AND CATALOGUES APPLY TO

THE THOMSON-HOUSTON MOTOR CO.,

620 ATLANTIC AVENUE, BOSTON, MASS.

W. D. SARGENT, President.
E. H. CUTLER, Treasurer and Manager.

JOHN A. BARRETT, Vice-President and Consulting Electrician.
FRANK A. PERRETT, Electrician.

The Elektron Manufacturing Company

79 and 81 WASHINGTON STREET, BROOKLYN, N. Y.,

MANUFACTURERS OF

PERRET ELECTRIC MOTORS AND DYNAMOS.

AUTOMATICALLY REGULATED.

Unexcelled in Simplicity and Durabiltiy.

THE ONLY MACHINES HAVING

LAMINATED FIELD MAGNETS

OF SOFTEST CHARCOAL IRON,

BY MEANS OF WHICH

HIGHER EFFICIENCY,

CLOSER REGULATION

AND SLOWER SPEED

Are Obtained than is Possible Otherwise.

CAREFUL INVESTIGATION INVITED.

THE BUTLER HARD RUBBER CO.,

No. 33 MERCER STREET, NEW YORK,

Manufacturers of Hard Rubber Goods of Every Description Including the Celebrated

HARD RUBBER BATTERY CELLS

MANUFACTURED UNDER KIEL'S PATENTS FOR

STORAGE AND PRIMARY BATTERIES.

CHEAPEST AND BEST CELLS IN THE MARKET.

Also SHEET, ROD AND TUBING (Kiel's Patent), for ELECTRICAL PURPOSES at REDUCED PRICES. Standard quality Sheet, Rod, Tubing, Insulator Hooks, Key Knobs, Switch Handles, Telephone Receivers and Battery Syringes constantly on hand. Hard Rubber Specialties of all kinds made to order. Send for Prices and Estimates.

For Sale by CENTRAL ELECTRIC CO., CHICAGO, ILL.

DAFT ELECTRIC LIGHT COMPANY,

EXECUTIVE OFFICES, 115 BROADWAY, NEW YORK.

AGENCIES:

13 South 4th St., Philadelphia. 119 La Salle Street, Chicago.

Electric Railways and Power Stations,

STATIONARY MOTORS, STORAGE BATTERIES.

DYNAMOS, 1 to 250 H. P. MOTORS, ½ to 100 H. P.

WORKS, JERSEY CITY, N. J.

"C. & C." Electric Motor Company,

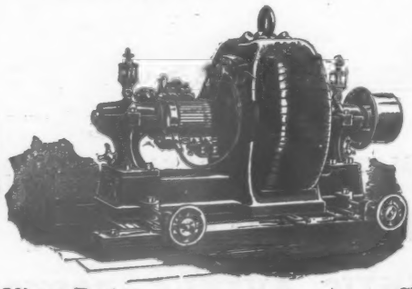
402 & 404 GREENWICH STREET, NEW YORK.

ALL STANDARD SIZES

—: OF :—

ELECTRIC MOTORS

From 1/8 H. P. to 40 H. P.



OVER 6,000 NOW IN USE

IN THE UNITED STATES,

Running Sewing Machines, Elevators, Printing Presses, Ventilating Fans, Blowers, Coffee Mills, Polishing and Grinding Tools, etc.

NEW ENGLAND OFFICE: 148 High St., cor. Oliver, Boston.
PHILADELPHIA OFFICE: 301 Arch Street.

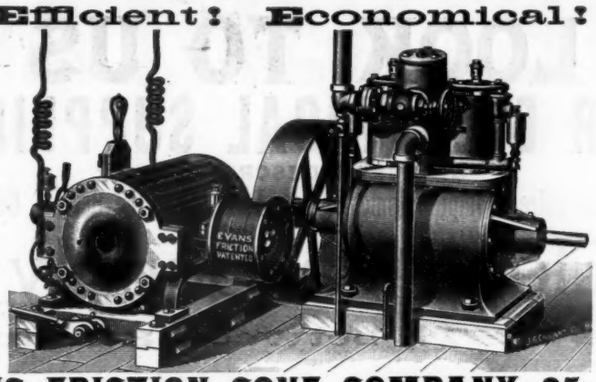
CHICAGO OFFICE: Phenix Building.
CINCINNATI OFFICE: 165 Walnut Street.

THE EVANS SYSTEM OF DRIVING DYNAMOS.

Simple! Efficient! Economical! Reliable!

GIVES:
STEADY LIGHTS,
Entire Control of Dynamos
(Can be Started and Stopped Independent of Engine.)
PERFECT SATISFACTION
Wherever Used.

THE EFFICIENCY AND POWER OF OUR SYSTEM DEPENDS ON THE USE OF OUR
LOOSE FRICTION BELTS.



SAVES:
ROOM,
BELTING,
POWER,
REPAIRS.

We guarantee as much Power with no more pressure on the bearings than by common belting.

Address: THE EVANS FRICTION CONE COMPANY, 85 Water Street, Boston.

LIST OF DYNAMOS IN STOCK.

Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,600 c. p. 8 amp. Y	No. Lights 1,300 c. p. 6 amp. Z	No. Lights 800 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in Inches.	Belt Speed Required.	Weight of Dynamo.
CHICAGO	8				6.5	1¼	5,000 FEET PER MINUTE.	830
		10			6.3	1¼		530
				25	8.0	2		530
	16				12.0	3		780
		20			12.5	3		780
			26		13.0	3		780
	30				15.0	3		990
		25			15.6	3		990
			32		15.0	3		990
				50	16.0	3		990
	28				21.0	4½		1,360

LIST OF DYNAMOS IN STOCK.

Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,600 c. p. 8 amp. Y	No. Lights 1,300 c. p. 6 amp. Z	No. Lights 800 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in Inches.	Belt Speed Required.	Weight of Dynamo.
CHICAGO		35			21.0	4		1,360
			45		21.0	4		1,360
				70	21.0	4½		1,360
	40				29.7	6		1,750
		50			30.0	6		1,750
			64		29.5	6		1,750
	52				38.0	8		2,290
		65			38.6	8		2,290
			83		38.0	8		2,290
	64				46.5	10		2,770
		80			47.1	10		2,770
	75				52.5	12		2,300

BAIN, 76 Market Street, CHICAGO, ILL.,

General Electrical Work, in all branches of Electrical Engineering. Consultation, etc. Correspondence confidential. TRY ME.

THE LEHIGH VALLEY
CREOSOTING CO.
WORKS, PERTH AMBOY, N. J.
Office, Foot of Washington Street, JERSEY CITY, N. J.
Creosoted Lumber, Underground Conduits, Telegraph Poles, Piling and Ties Furnished.

L. F. JORDAN, Patentee and General Manager. W. S. HILL, Consulting Engineer.

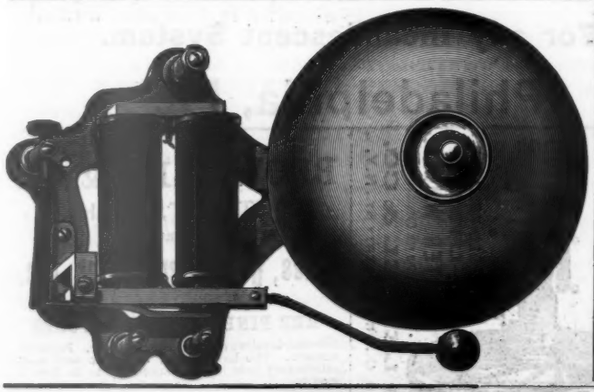
JORDAN'S

System of Electric Lighting for Street Railway Trains has been in perfect operation on the West End Street Railway in Boston for a Month.

L. F. JORDAN & CO., 133 Oliver St., Boston, Mass.

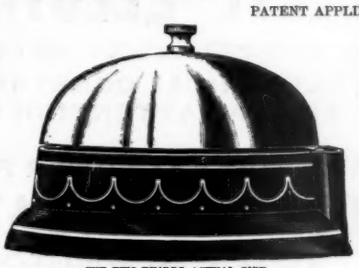
POND ENGINEERING CO.,
ENGINEERS AND CONTRACTORS.
Complete Steam Plants for Electric Light and Power.
Engines, Boilers, Furnaces, Grates, Heaters, Pumps, Injectors, Pipe Work, Belting, etc., designed with special reference to the HIGHEST EFFICIENCY.
Our Extended Experience Enables us to Guarantee Satisfaction. Send for New Illustrated Pamphlet.
ST. LOUIS, CHICAGO, KANSAS CITY AND OMAHA.

Manufacturers



H. E. & C. BAXTER,
18 Fulton Street, Brooklyn, E. D.

THE
KING BELL
PATENT APPLIED FOR.



CUT TWO-THIRDS ACTUAL SIZE.

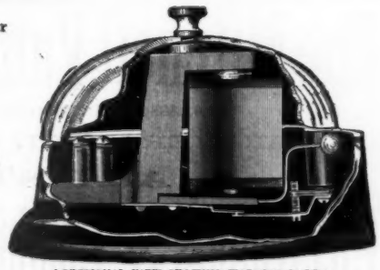
SOMETHING ENTIRELY NEW.
EASY OF ADJUSTMENT.
SOLID IRON BASE.
NICKEL-PLATED GONG.

Can be Adjusted before or after placing in position.

Working Parts Completely Protected.

Neat, Reliable and Substantial.

FOR PRICES, SEE OUR CATALOGUE.



SECTIONAL VIEW SHOWING WORKING PARTS.

FRANKLIN S. CARTER. CHAS. M. WILKINS. E. WARD WILKINS
TRADING AS
PARTRICK & CARTER,
Manufacturers of and Dealers in Every Description of
Electrical Supplies
SOLE PROPRIETORS OF THE
PATENT NEEDLE ANNUNCIATORS.
114 SO. SECOND ST., PHILADELPHIA, PA.
Established 1867.

THE NATIONAL CARBON CO.
CLEVELAND, OHIO.
MANUFACTURERS OF
ELECTRIC LIGHT CARBONS AND BATTERY MATERIAL.

OKONITE
TRADE MARK.
WIRES, CABLES, TAPE AND CORD.

LOOK TO US
FOR ELECTRICAL SUPPLIES
OF EVERY DESCRIPTION.
We Guarantee Prompt Shipments, Low Prices, and the Best of Goods.

INCANDESCENT
LAMPS
—AND—
ALL KINDS OF FITTINGS.

Southern Electrical Supply Company
823 LOCUST ST., between 8th and 9th Sts.
WRITE FOR CATALOGUE.
ST. LOUIS, MO.

P. MINTURN SMITH - President.
WILLIAM D. PERRY - Vice Prest.
G. G. FRELINGHUYSEN - Secretary
CHARLES TREMAINE - Treasurer
JAMES W. EASTON - Electrician

THE EASTON ELECTRIC Co.
ELECTRICAL APPARATUS FOR ARC AND INCANDESCENT LIGHTING
Office 45 BROADWAY
New York.

H. E. THURBER, PREST. HENRY E. HAWLEY, VICE-PREST. JAMES A. TAYLOR, SECY. AND TREAS.

THE COMPLETE ELECTRIC CONSTRUCTION CO.,
14 Cortlandt Street, New York.
CONTRACTORS FOR ELECTRICAL CONSTRUCTION OF ALL KINDS.
SPECIAL ATTENTION PAID TO LAYING UNDERGROUND, DEEP SEA AND AERIAL CABLES.
STORAGE BATTERY POWER FURNISHED AND MAINTAINED.
ELECTRIC LIGHT INSTALLATIONS A SPECIALTY.
JOHN A. SEELY, Gen'l Manager.

The Mitchell Vance Company
(SUCCESSOR TO MITCHELL, VANCE & CO.)
DESIGNERS AND MAKERS OF
ARTISTIC
Electroliers & Combination Fixtures
FOR ANY SYSTEM OF INCANDESCENT ELECTRIC LIGHTING.

The feeling is growing that these goods should be specially adapted to the light medium; to meet this want New Designs of Artistic merit and unexcelled finish have been originated which commend themselves to intending purchasers, being shown in Parlors illuminated by Electric light.

Architects and Decorators Designs and suggestions carried out with fidelity to the given motive.

MANUFACTORY, 24th & 25th Sts. & 10th Ave.
SALESROOMS, No. 836 & 838 BROADWAY, NEW YORK.

WRITE For the Electrical Review's *New Catalogue* of all Electrical and Scientific Books.
18 PARK ROW, NEW YORK.

THACKARA MANUFACTURING CO.,
DESIGNERS AND MAKERS OF
GAS, ELECTRIC & COMBINATION FIXTURES
For any Incandescent System.
Philadelphia, Pa.

GIVES MORE POWER USING LESS WATER THAN ANY OTHER WHEEL.
THE OLD RELIABLE
LEFFEL
WATER WHEEL
SEND FOR CATALOGUE.
JAMES LEFFEL & CO.
SPRINGFIELD, O., OR 110 LIBERTY ST., N.Y.

BROWNLEE & CO.
DETROIT, MICH.,
DEALERS IN
Poles, Cross Arms, Pins, Etc.
RED PINE OCTAGONAL POLES
for electric railways and electric lighting. Perfectly straight. The handsomest, strongest and most satisfactory pole in the market. 24 to 34 feet in length.
CEDAR TELEGRAPH POLES
of all sizes always in stock.
CROSS ARMS AND PINS
at lowest prices.
SEND FOR CIRCULARS.

THE MATHER SYSTEM

FOR LOW PRESSURE INCANDESCENT LIGHTING AND TRANSMISSION OF POWER.

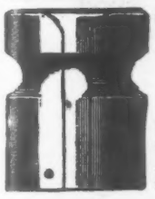
OWNED, CONTROLLED AND MANUFACTURED

BY THE

MATHER ELECTRIC CO., Manchester, Conn.

ESTIMATES FURNISHED FOR BLOCK STATIONS, ISOLATED INCANDESCENT LIGHT AND POWER PLANTS.

New York Office, 35 Broadway. Boston Office, 105 Summer St. Chicago Office, 11 Metropolitan Block. Cincinnati Office, 56 Longworth St.



Porcelain Electrical Supplies and Specialties,

MANUFACTURED BY

EMPIRE CHINA WORKS,

144 & 156 Greene St., GREENPOINT, BROOKLYN, E. D., N. Y.

Our Ware is HARD PORCELAIN, the BODY and GLAZE IDENTICAL, and GUARANTEED NON-CONDUCTIVE for all ELECTRICAL PURPOSES.

THE

PARKER-RUSSELL MINING & MFG. CO.

MERMOD-JACCARD BUILDING,

Cor. Broadway and Locust St. Rooms 307 and 308.

ST. LOUIS.

UNIFORM IN QUALITY, LONG LIFE AND GOOD LIGHT

ALL GENUINE INGOTS & MANUFACTURES BEAR OUR REG. TRADE MARKS
Phosphor Bronze
PHOSPHOR-BRONZE
INGOTS, CASTINGS & MANUFACTURES.
THE PHOSPHOR BRONZE SMELTING CO. LIMITED
512 ARCH ST. PHILADELPHIA PA. U.S.A.
ORIGINAL MANUFACTURERS OF PHOSPHOR-BRONZE IN THE UNITED STATES AND OWNERS OF THE U.S. PATENTS.

THE

Horn, Brannen & Forsythe Manufacturing Co.

(INCORPORATED.)

Designers and Manufacturers of

Gas & Combination Fixtures,

AND

ELECTROLIERS,

427 to 433 North Broad St.

PHILADELPHIA.

CORRESPONDENCE SOLICITED.

THE

American Bell Telephone Company,

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30, 1877, No. 186,787.

The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.

THE 7th ANNUAL CATALOGUE AND PRICE-LIST

Of the Electric Gas Lighting Co., just out, illustrates and describes everything in the line of Electrical House, Hotel, Church, Theatre and Office furnishings, including Call Bells, Annunciators, Electric Gas Lighting Apparatus, Batteries and Battery Material (including the Samson, "the King of Open Circuit Batteries"), Frictional Lighting Goods, Electro-Mechanical Gongs, Electric Door Openers, Locks and Cut-Outs, Speaking Tube Supplies, etc. Large numbers of contractors and dealers throughout the country hardly consider it the prudent thing to purchase any considerable quantity of Domestic Electrical Apparatus without first having examined and priced the special manufactures of this Company.

We also carry an extensive line of General Electrical Goods, such as Magneto and Extension Bells, Fire Alarm and Burglar Alarm Implements, Electro-Medical Apparatus and fine Electrical Instruments, Telegraph Instruments and Supplies, Insulated Wires and Cables, Electric Light and Line Supplies, etc., etc. Of course, our numerous Western and Southern friends, who come within six or eight hours' ride of us, are always expected to come over to see us. Boston is not only headquarters for everything electrical, you know, but—but it's the "Hub of the Universe," and it is assumed you'll not be entirely happy until you visit it! Strangers who send for our Catalogue and Price-List, should inform us whether or not they are in the Electrical trade. SEND YOUR BUSINESS CARD. Address,

THE ELECTRIC GAS LIGHTING CO.

LOUIS W. BURNHAM, Vice-President and Manager, 195 Devonshire Street, Boston Mass.

EXCELSIOR ELECTRIC CO.,

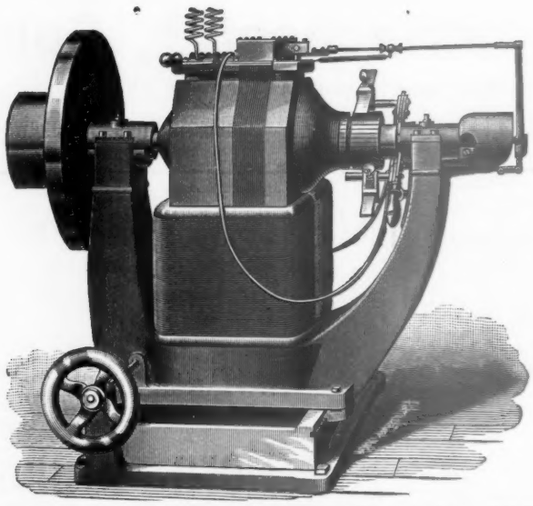
WILLIAM HOCHHAUSEN, ELECTRICIAN.

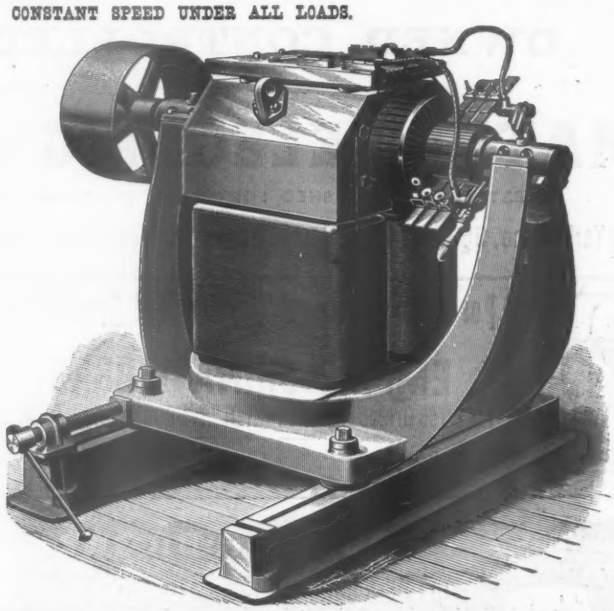
MOTORS

FOR ARC AND INCANDESCENT CIRCUITS.

WOUND FOR ANY CURRENT. PERFECT AUTOMATIC REGULATION

HIGHLY EFFICIENT AND ECONOMICAL. CONSTANT SPEED UNDER ALL LOADS.





OFFICE, 115 BROADWAY, N. Y. WESTERN OFFICE, 11 E. ADAMS ST., CHICAGO.

HOLMES, BOOTH & HAYDENS,

MANUFACTURERS OF

BARE AND INSULATED WIRE,

Underwriters' Copper Electric Light Line Wire, handsomely finished, highest conductivity. Copper Magnet Wire, Flexible Silk, Cotton and Worsted Cords for Incandescent Lighting. Round and Flat Copper Bars for Station Work. Insulated Iron Pressure Wire.

TRADE MARK "K.K."

PATENT "K. K." LINE WIRE

TRADE MARK "K.K."

For Electric Light, Electric Railways, Motors, Telegraph and Telephone Use.

Agents for the WASHINGTON CARBON CO.,

FACTORIES: WATERBURY, CONN.

NEW YORK OFFICE, 25 Park Place,

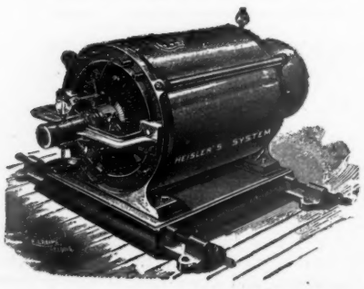
THOS. L. SCOVILL, NEW YORK AGENT.

THE

HEISLER PATENT LONG DISTANCE INCANDESCENT ELECTRIC LIGHT SYSTEM

Awarded the Highest Distinction, a Gold Medal, at the Paris Exposition, 1889.

UNEQUALLED FOR DISTRIBUTION OVER WIDE AREAS.



Specially adapted for Street, Commercial and Domestic Illumination from Central Stations. Plant may be located where Power can be secured Cheapest, even if Miles Distant from the Lighting. Safety, Reliability, and Financial Success fully Demonstrated. Plan of Wiring the Simplest, Cheapest, and Most Efficient. Strictly Series. Lamps, 10 to 100 Candle Power. Long Life without Blackening. Dynamo Self-Contained and Automatic.

SEND FOR CIRCULARS. CORRESPONDENCE SOLICITED.

HEISLER ELECTRIC LIGHT CO., 809 to 817 South Seventh St., ST. LOUIS, MO.

ELECTRIC LIGHT

SUPPLIES AND MATERIAL

OF EVERY KIND, FOR

Arc AND Incandescent Systems.

Poles, Cross-Arms, Brackets, Insulators, Bare and Covered Wire, Moulding, Switches, Cut-Outs, Lamps, Fixtures, Flexible Cord, Etc., Etc.

Electric Railway, Telephone, Telegraph and Housework Supplies.

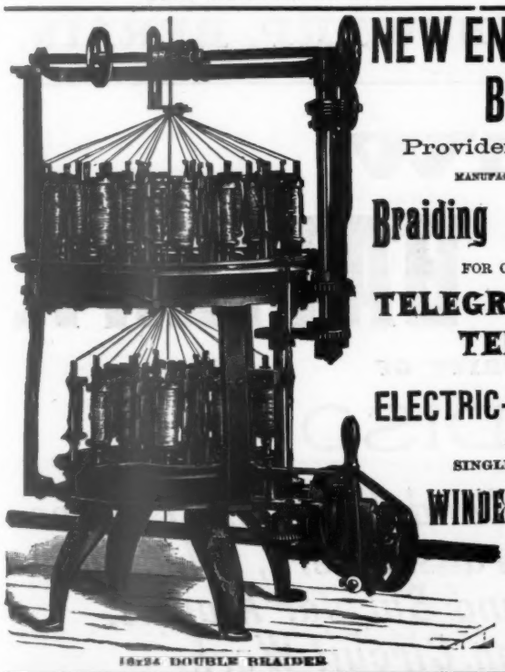
SEND FOR CATALOGUE AND QUOTATIONS.

THE EMPIRE CITY ELECTRIC CO.,

15 DEY STREET, NEW YORK.

O. E. MADDEN, President. E. T. GILLILAND, Vice-President.

A very handsome, highly polished, neat, light and strong Shade Holder, to fit any socket, in 2¾ and 3¼ in. sizes. Prices extremely reasonable.



18x24 DOUBLE BRAIDER

NEW ENGLAND BUTT CO.,

Providence, R. I.,

MANUFACTURERS OF

Braiding Machinery

FOR COVERING

TELEGRAPH, TELEPHONE

AND

ELECTRIC-LIGHT WIRE

ALSO

SINGLE AND DOUBLE

WINDERS AND BRAIDERS

Of every Description for Silk, Worsted and Cotton Braid.

FINE CASTINGS A SPECIALTY

TESTING BELL.

MAGNETO TESTING BELLS
MAGNETO SIGNAL BELLS.
MAGNETO Extension Bells.
MAGNETO Bells of all Sorts

Great Reduction in Wood Cleats.

WRITE FOR PRICES.

District Telegraph Call Boxes and Supplies. Large assortment of Electrical Supplies constantly on hand.

SEND FOR CATALOGUE.

VIADUCT MAN'F'G COMPANY,

BALTIMORE, MD.

THE STREET RAILWAY JOURNAL

Vol. VI. 113 Liberty St., New York. Monthly, $2.00 Per Year.

THE STREET RAILWAY JOURNAL, 113 Liberty Street, NEW YORK.

CONTENTS.

Each issue contains 180 pages or more, including 40 to 60 pages of reading matter and illustrations.

A Directory of Street Railways in the United States and Canada.

A Directory of Manufacturers of street railway appliances and materials.

Is the Best Advertising Medium through which to reach Street Railways.

Shield Brand Moisture-Proof Line Wires.

SEND FOR CIRCULAR No. 589.

Habirshaw Rubber Covered Wires.

FUSE WIRE.

SEND FOR LIST No. 596.

Wirt Standard Voltmeter.

Interior Electrical Conduits.

SEND FOR CIRCULAR LIST No. 598.

INCANDESCENT LAMPS.

OUR ILLUSTRATED CATALOGUE No. 560 IS THE MOST COMPLETE WORK OF ITS KIND EVER ISSUED.

THE ELECTRICAL SUPPLY CO.,

Eastern Office and Factories: Ansonia, Conn.

Western Office and Warehouse: 171 Randolph St., Chicago.

WRITE For the Electrical Review's *New Catalogue* of all Electrical and Scientific Books.

18 PARK ROW, NEW YORK.

Western Electric Co.'s
ELECTRIC LIGHTING SYSTEMS.

DYNAMOS.

With All Necessary Appurtenances.

INCANDESCENT AND ARC, HIGH OR LOW TENSION.

Arc Lamps, 2,000, 1,500, 1,200 Candle-Power.

HIGH OR LOW TENSION. SINGLE OR DOUBLE.

Simple in Construction, Economical in Operation, and Perfect in Regulation. We are prepared to estimate on Plants, either with or without power.

WESTERN ELECTRIC COMPANY,

CHICAGO, NEW YORK, LONDON, ANTWERP, BERLIN.

THE NEW
EDISON-LALANDE BATTERY.

MANUFACTURED UNDER AUTHORITY OF

THOMAS A. EDISON.

Primary Batteries for Telegraph "Mains" and "Locals," Electro-Motors, Electro-Plating, Telephone Transmitters, Electro-Medical Instruments, Annunciators and Burglar Alarms, and all Classes of Closed and Open Circuit Work.

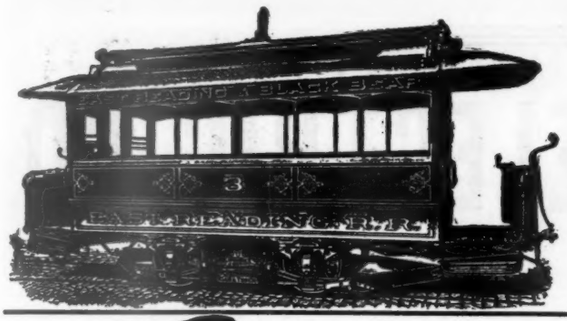
FURTHER PARTICULARS AND INFORMATION FURNISHED UPON APPLICATION.

ADDRESS:

EDISON MANUFACTURING COMPANY,

JAMES F. KELLY, General Sales Agent,

19 Dey Street, New York.



JOHN STEPHENSON COMPANY

LIMITED,

NEW YORK.

Street Cars

FOR

Electric Motors.

Cleverly

1018 CHESTNUT ST., PHILA.

PATENT

DOUBLE

LIFT-OVER

PENDANT BURNER

Igniting Gas or Gasoline by Electricity.

This **PENDANT BURNER** has the Double Lift-Over Electrode, which saves two-thirds of Battery Power and avoids Short Circuiting, which is liable to occur in many others.

The Double Lift-Over Electrode is a very important feature no other Pendant has.

Electric Spark or Connection only when Gas is Ignited.

Electric Gas Lighting Apparatus.
Electric Bells and Annunciators.
General Electrical Supplies.
Electrical Specialties to Contract.

NEW YORK BELTING AND PACKING CO.

LARGEST BELTS IN THE WORLD.

RUBBER BELTING, PACKING, HOSE,— —MATS, MATTING, STAIR-TREADS.

15 PARK ROW, NEW YORK:
(OPPOSITE ASTOR HOUSE.)

J. H. CHEEVER, TREAS. J. D. CHEEVER DEP'Y. TREAS.

Washburn & Moen Mfg. Co.

WORCESTER, MASS.

MAKERS OF

IRON AND STEEL

MANUFACTURERS OF

Iron and Copper Wire for Electrical Purposes.

PATENT GALVANIZED TELEGRAPH & TELEPHONE WIRE,

In Long Lengths, Galvanized by our Patent Continuous Process.

The Standard with all Telegraph and Telephone Companies.

Since the first introduction of the Electric Telegraph Service, our patent wire, expressly manufactured for electric purposes, has filled every requisition as regards strength, evenness of quality, and conductive capacity.

Send for Price Lists and descriptive pamphlets, and "Hand-book of Wire in Electric Service." Sent free on application.

New York Warehouse, 16 CLIFF STREET.

Chicago Warehouse, 107 & 109 LAKE ST.

Warerooms, 224-232 Canal St., 118-126 Walker St., NEW YORK.

Manufactory, Flushing & Carlton Avenues, Brooklyn.

OXLEY, GIDDINGS & ENOS,

DESIGNERS AND MAKERS OF

Electroliers and Combination Fixtures

UNSURPASSED FACILITIES

For producing fixtures of the most approved designs for any system of

INCANDESCENT LIGHTING.

Special designs furnished upon application. Suggestions from architects and decorators faithfully executed.

WRITE For the Electrical Review's *New Catalogue* of all Electrical and Scientific Books.

18 PARK ROW, NEW YORK.

THE GOODRICH HARD RUBBER CO.
AKRON, OHIO.

Manufacturers of
HARD RUBBER GOODS
FOR ELECTRICAL PURPOSES

SPECIALTIES OF ALL KINDS TO ORDER
SEND FOR CATALOGUE.

S. Y. L'HOMMEDIEU & CO., Eastern Agents, 65 Reade St., N. Y.

SOFT RUBBER GOODS
FOR ELECTRICAL PURPOSES
TUBING ALL SIZES
PURE RUBBER TAPE · FRICTION TAPE
Pure Sheet Rubber Etc.

Samples and prices upon application.
Address THE B.F. GOODRICH CO.
AKRON RUBBER WORKS
AKRON, OHIO.

S. Y. L'HOMMEDIEU & CO., Eastern Agents, 65 Reade St., N. Y.

FARADAY CARBON CO.,

ELECTRIC LIGHT CARBONS, PITTSBURGH, PA.

THE

WESTINGHOUSE ELECTRIC CO.

Arc and Incandescent Lighting

ON THE

TRANSFORMER SYSTEM.

An experience of over two hundred and sixty-five central stations has demonstrated the converter system of electric lighting to be the only safe system.

The converter of **THE WESTINGHOUSE ELECTRIC COMPANY** is so constructed as to absolutely prevent by any possibility a connection between the current of tne street wires and the wires connected with the lamps on the premises.

The converter of this Company reduces the potential of the primary wires and limits the quantity of current to the exact requirements.

It is the only system which admits of reliable meters.

There is not a single recorded instance of a connection between the primary and secondary circuits of this Company's system.

Two hundred and sixty-five central stations in operation with a total dynamo capacity in 16 candle power lamps of 458,250.

Over twelve thousand meters in use.

WRITE FOR PARTICULARS.

THE

WESTINGHOUSE ELECTRIC CO.

Pittsburgh, Pa., U. S. A.

Boston, New York, Chicago, St. Louis, Cincinnati, San Francisco, Portland, Charlotte, Dallas.

COMPOUND. CONDENSING OR NON-CONDENSING.
16 Sizes, 5 to 500 H. P. Not yet equaled by any firm of Engine for HIGH FUEL DUTY AND SIMPLICITY.

STANDARD. 13 Sizes in Stock. 5 to 250 H. P.
3,000 in use in all parts of the Civilized World.

JUNIOR. 6 Sizes in Stock, 5 to 50 H. P.
AN AUTOMATIC ENGINE CHEAPER THAN A SLIDE VALVE.
Well Built. Economical. Reliable. Over 300 sold the first year.

All the above built strictly to Gauge with Interchangeable Parts. Repairs Carried in Stock. Send for Illustrated Catalogues.

WESTINGHOUSE ENGINES

The Westinghouse Machine Co.
PITTSBURGH, PA. U.S.A.

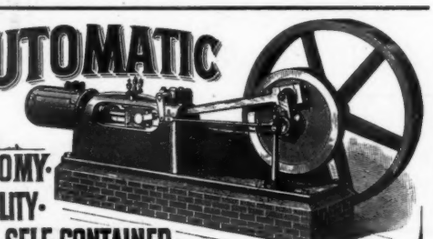
SELLING DEPARTMENT IN THE UNITED STATES.

NEW YORK,	17 Cortlandt Street,	Westinghouse, Church, Kerr & Co.
BOSTON,	Hathaway Building,	
PITTSBURGH,	Westinghouse Building,	
CHICAGO,	156, 158 Lake Street.	
PHILADELPHIA,	606 Chestnut St., M. R. Muckle, Jr. & Co.	
ST. LOUIS,	302, 304 Washington Ave.	Fairbanks & Co.
KANSAS CITY,	312 Union Avenue.	
DENVER,	1530 Seventeenth Street,	
OMAHA,	1619 Capitol Avenue, F. C. Ayer.	
PINE BLUFFS, Ark.		Geo. M. Dilley & Sons.
SALT LAKE CITY,	259 S. Main St.	Utah & Montana Machinery Co.
BUTTE, MONT.	E. Granite St.	
SAN FRANCISCO,	21 and 23 Fremont St., Parke & Lacy Co.	
PORTLAND, OR.	33, 35 N. Front St., Parke & Lacy Mch. Co.	
CHARLOTTE, N. C.	36 College St.,	The D. A. Tompkins Co.
ATLANTA, GA.	45 S. Prior St.	
DALLAS, TEX.		Keating Imp. & Mch. Co.
CHATTANOOGA, TENN.		C. E. James & Co.

WE BUILD
FIVE (5) SIZES UNIVERSAL MILLING MACHINES.
No. 0, No. 1, No. 2, No. 3 and No. 4.
No. 1 and No. 2 Ready for Immediate Delivery.
GIVE US A CALL AND WE CAN SATISFY YOU.
Send for Descriptive Circular on Universal Milling Machines
THE GARVIN MACHINE CO.,
Office and Works, Laight and Canal Sts.,
NEW YORK.

FRICTION CLUTCH PULLEYS
AND CUT-OFF COUPLINGS.
CHARACTERISTICS:
Vice-Like Grip of Clutches Optionally Gradual or Sudden. Large Friction Surfaces Prevent Undue Wear. Disengagement of Clutches is Positive. Pulley Shaft is Automatically Oiled. They have a Good Record. Grip of Clutches Self-Maintaining. Experts are invited to examine Peculiarities.
ECLIPSE WIND ENGINE CO.,
Send for 1889 Catalogue. Beloit, Wis.

THE RICE AUTOMATIC



GUARANTEED ECONOMY · REGULATION · DURABILITY · SIMPLICITY · SELF-CONTAINED ·
8 TO 300 H.P. PAIR & TANDEM COMPOUNDS.
THE JOHN T. NOYE MFG CO. BUFFALO. N.Y.
FAIRBANKS, MORSE & CO., Western Representatives, Chicago, St. Louis, Kansas City, Omaha, Denver, St. Paul
ALBERT FISHER, 89 Liberty Street, New York, Eastern Agent.

R. T. WHITE,
12 Pearl St. (Room 6), BOSTON, MASS.
NO BOLTS THROUGH THE RAILS.

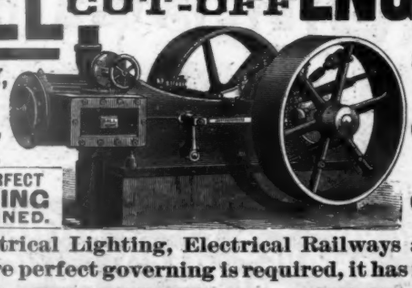
DAISY CHAIR.
IMPROVED
PATENTED MATERIAL
FOR STREET RAILWAY
ROADBEDS.
BEST MATERIAL. LOWEST PRICES.
CORRESPONDENCE SOLICITED.
THOMAS ASHBURNER, Western Agent, Kansas City, Mo.
Rolled any weight desired. Patent allowed.
Sample Chair and Section of Rail Sent, Express Prepaid, to Prospective Purchasers.

JARVIS ENGINEERING COMPANY,
CONTRACTING ENGINEERS for ERECTING COMPLETE STEAM PLANTS
For Electric Lighting and Power Stations.
—: AGENTS FOR :—
ARMINGTON & SIMS ENGINES,
JARVIS BOILER SETTING,
to burn Anthracite Coal and Coke Screenings,
NATIONAL FEED WATER HEATER,
NATIONAL ROCKING and
SHEFFIELD GRATE BARS.
61 Oliver Street, Boston.
SEND FOR NEW CATALOGUE.

New Tangye Buckeye Automatic Cut-off Engines.
25 to 1,000 H. P.

In Use, Over 2,500.
These engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and Superior regulation guaranteed. Self-contained Automatic Cut-off Engines 12 to 200 H. P. for driving Dynamo Machines a Specialty. Illustrated Circulars, with various data as to practical Steam Engine Construction and performance, free by mail.
Address BUCKEYE ENGINE CO., Salem, Ohio.
SALES AGENTS:
W. L. SIMPSON, 10 Telephone Building, 18 Cortlandt Street, N. Y.
N. W. ROBINSON, 154 Washington St., Chicago, Ill. ROBINSON & CARY, St. Paul, Minn.

BALL AUTOMATIC CUT-OFF ENGINE
RELIABILITY, ECONOMY, SIMPLICITY, DURABILITY.
THE MOST PERFECT GOVERNING EVER OBTAINED.



STANDARD
DOUBLE COMPOUND
TANDEM COMPOUND
For Electrical Lighting, Electrical Railways and purposes where perfect governing is required, it has no equal.
BALL ENGINE CO., ERIE, PA.

WILLIAMS & POTTER,
15 CORTLANDT ST., NEW YORK.
Engineers & Contractors,
GENERAL AGENTS,
STRAIGHT LINE ENGINES

Bernstein Electric Co.
INCANDESCENT LAMPS
— FOR —
ARC LIGHT CIRCUITS,
SIMPLE. RELIABLE. DURABLE.
The only safe socket for series lamps and the only socket having insulating material for the outside parts.
Send for Illustrated Catalogue.
620 Atlantic Ave., BOSTON.
CHICAGO OFFICE, 80 ADAMS ST., GEORGE CUTTER, Agent.

CHARLES R. VINCENT & CO.,
15 CORTLANDT STREET, NEW YORK,
Ball High Speed Automatic Cut-off Engines
MANNING VERTICAL TUBULAR BOILERS,
Complete Steam Plants Furnished and Erected.

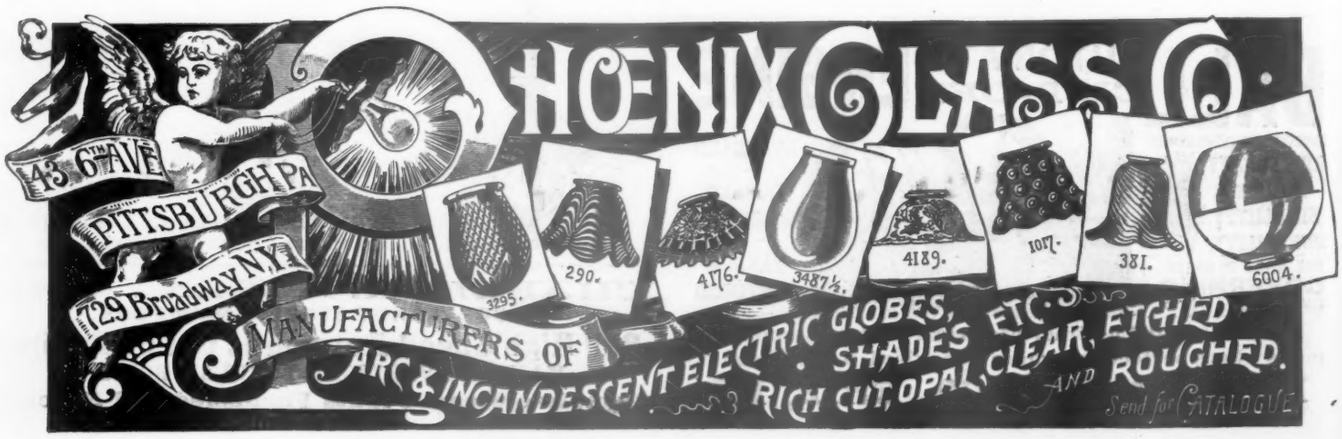
JOHN W. MASON, Manager.
SPECIAL AGENTS

OKONITE
TRADE MARK.
WIRES AND CABLES.

GATE CITY ELECTRIC COMPANY
— HAVE A FULL STOCK OF —
ELECTRICAL SUPPLIES
And will make LOW Prices and PROMPT Shipments.
522 DELAWARE ST., - - KANSAS CITY, MO.

VULCANIZED FIBRE.
The Only Original Substitute for Hard Rubber.
IN SHEETS, TUBES, RODS, DISCS AND SPECIAL SHAPES TO ORDER.
COLORS RED, GRAY AND BLACK. QUALITY BETTER AND PRICES LOWER THAN EVER.
Adopted by the leading Electric Light Companies and Manufacturers of Electrical Apparatus in United States and Europe, being a better Non-Conductor, Lighter and More Durable, at Half the Cost.
SEND FOR SAMPLES AND PRICE LIST.
VULCANIZED FIBRE CO., Wilmington, Del.
ESTABLISHED 1873. NEW YORK OFFICE, 14 DEY STREET.

CONRAD N. JORDAN, President. E. GOGORZA, Vice-Prest. & Treas. JAMES DUNNE, Secretary. J. B. BURDICK, Manager.
The Trinidad-Heimann Insulated Wire Co.,
OFFICE, 49 LIBERTY STREET, NEW YORK. WORKS, HARRISON, N. J.
The Celebrated Trinidad LINE WIRE.
THE HEIMANN FIREPROOF INSULATED WIRE.
House Wire, Underground and Submarine Cables, and Callender System of Underground Wire, Manufactured by this Company.



FRAUD! FRAUD!!

RECOGNIZING THE POPULARITY

OF THE

SAWYER-MAN LAMPS

Unscrupulous persons manufacture Lamps in bases stamped

"SAWYER-MAN PATENTS."

These Manufacturers being financially irresponsible,

THE SAWYER-MAN ELECTRIC COMPANY

Hereby gives notice that it will enforce

THE STRINGENT LAWS

Regarding Fraudulent Patent-Marks, against the USERS of such Lamps.

SAWYER-MAN ELECTRIC COMPANY,

510-534 WEST 23d STREET,

NEW YORK.

- REMOVAL. -

We invite our friends and the trade generally to call upon us in our new quarters,

116 and 118 Franklin Street,

where we are now located and ready for business.

Our very much increased facilities enable us to carry a larger stock, a more diversified line and make shipments promptly and with better care than formerly.

We invite all to give us a call, and if this cannot be done in person, send us your orders instead and they will be appreciated.

CENTRAL ELECTRIC COMPANY

ELECTRICAL SUPPLIES,

116 & 118 FRANKLIN STREET, CHICAGO.

VULCABESTON INSULATION.

VULCANIZED ASBESTOS FIBRE.

CAN BE MOULDED INTO ANY DESIRED SHAPE.

Large Moulded Pieces a Specialty. Also Sheet Insulation from .02 to 1 1-2 Inches in Thickness.

This Insulation does not shrink, swell or absorb moisture, and is especially adapted for Dynamo work, as it is not affected by heat.

MANUFACTURED BY **THE JOHNS-PRATT CO.,** HARTFORD, CONN.

FAIRBANKS & CO., 311 *BROADWAY, NEW YORK.* — *H. W. JOHNS MFG. CO.*, 87 *MAIDEN LANE, NEW YORK.* — *FAIRBANKS, BROWN & CO.*, 83 *MILK STREET, BOSTON.* — *CHAS. W. TRAINER & CO.*, 44 *OLIVER STREET, BOSTON.*

AWARDED THE GRAND PRIZE

AT LATE PARIS EXPOSITION.

Something New! One, two, three, and four spindle drills for light work.

DRILLS

The most useful patented improvement in drill presses for years is applied.

SENSITIVE

Spindles driven with single, endless belts. Large driving pulleys, tightener and variable speeds provided.

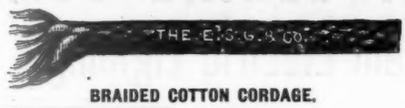
Over 1,000 in use. Buy the **latest** and **best.** Special machinery to order. Catalogue of fine tools free.

Dwight Slate Machine Co.

HARTFORD, CONN.

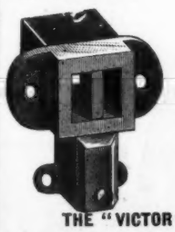
THE E. S. GREELEY & CO., 5 & 7 DEY STREET, NEW YORK.

THOMSON REFLECTING GALVANOMETER.


BRAIDED COTTON CORDAGE.

RUBBER BASE FUSIBLE CUT-OUT.

WE ARE MANUFACTURERS.



THE "VICTOR" SWITCH PLUG AND SOCKET FOR ARC CURRENTS.

WE ARE FIRST HANDS.

LOCKWOOD AMMETER AND POLARITY INDICATOR.

HEADQUARTERS FOR ELECTRICAL SUPPLIES AND TOOLS.

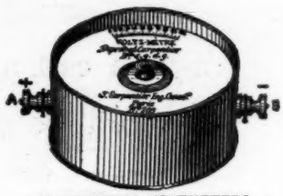
SKELETON ROPE CLEATS.

ELECTRIC LIGHT SPECIALTIES.

AYRTON & PERRY VOLT AND AMMETERS.

FLOOR INSULATORS.

ELECTRICAL TEST INSTRUMENTS.


CARPENTIER VOLTMETERS AND AMMETERS.

PLAIN CEILING ROSETTES. IN WOOD, PORCELAIN AND GLASS.

ARC GLOBE NETS.

FLAT TIN SHADE.

FUSIBLE WIRE CONNECTOR.

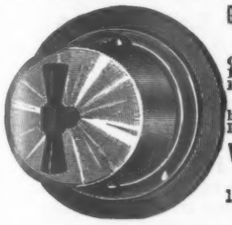
HARD AND SOFT RUBBER SOCKET BUSHINGS.

SCALLOPED OPAL SHADE.

Forest City Electric Works

MANUFACTURERS OF

Cleveland's Electric Light Cut-outs

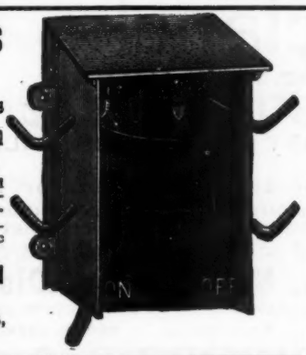


Gang Switches from 5 to 40 Amperes.

Quick make and Break uncontrolled by the Handle.

Correspondence Solicited with Electric Light Companies.

W. B. Cleveland
PROPRIETOR,
183 Seneca Street,
CLEVELAND, O.



EXTRACT FROM THE REPORT

— OF —

DR. SCHUYLER S. WHEELER,

— ON —

Underground Arc Light Wires in New York.

The line in 125th Street, 2,000 feet in length, is laid in the small ducts of the Johnstone system of conduits. The cable is a ***BISHOP GUTTA PERCHA WHITE CORE***, and was laid immediately after the order for the work was given. The cable was connected to overhead arc light wires by running it up in a two-inch iron pipe fastened to the outside of an ordinary city electric lamp post. Connections were made with lights in front of stores by carrying the cable from the ducts in iron pipes under the sidewalk and up the front of the stores. This line has been in continuous use for two months, carrying a pressure of 2,500 volts, and it shows an actual rise in insulation with age and use, as will be seen from the following tests:

Jan. 11th, 1,100 Megohms.
Feb. 12th, 1,800 Megohms.
April 12th (including eight arc lamps and branch leads), 2,000 Megohms.

All our White Core India Rubber Insulation is Same Quality as on above cables.

BISHOP GUTTA PERCHA CO.,

420-426 EAST 25TH ST., NEW YORK.

JOHN A. ROEBLING'S SONS CO.

MANUFACTURERS OF

Underwriters', Weatherproof, Office and Annunciator Wire.

MAGNET WIRE

AND ALL OTHER KINDS OF

Insulated Electric Wires and Cables.

Hard Drawn and Soft Bare Copper Wire. Galvanized Telegraph Wire.
PLAIN AND GALVANIZED WIRE OF EVERY DESCRIPTION.
Iron, Steel, Copper and Galvanized Wire Rope.

JOHN A. ROEBLING'S SONS CO.,
NEW YORK OFFICE AND WAREHOUSE, 117 & 119 LIBERTY ST.,
H. L. SHIPPY, Secretary.

Chicago Office & Warerooms, 171-173 Lake St., Geo. C. Bailey, Manager.
WORKS: TRENTON, N. J.
San Francisco Office & Warerooms 8 California St., S. V. Mooney, Manager.

CARBON PLATES & CARBON BATTERIES

ELECTRIC LIGHT CARBONS.

MADE FROM NATURAL GAS BY PATENTED PROCESS.

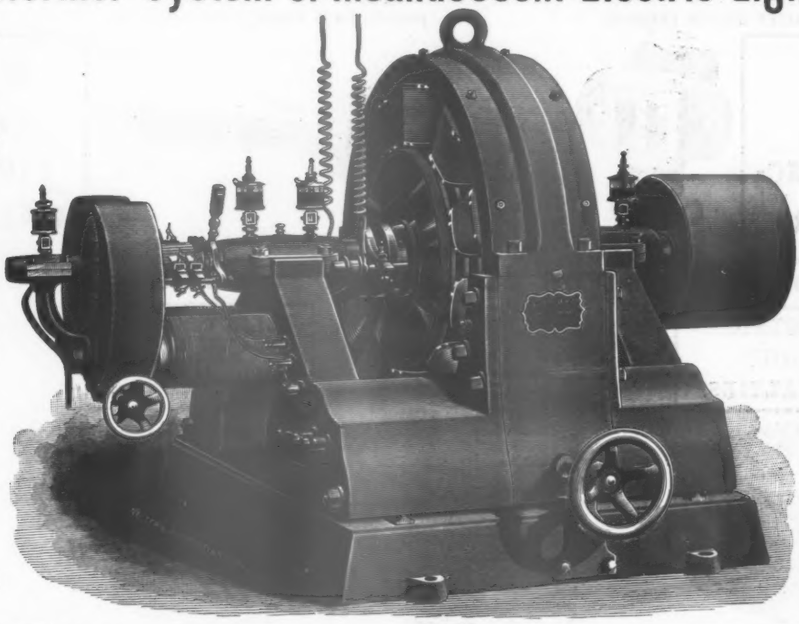
— ADDRESS —

SOLAR CARBON & MANUFACTURING CO.,
95 & 97 FIFTH AVE., PITTSBURGH, PA.

NATIONAL ELECTRIC MANUFACTURING COMPANY.

Transformer System of Incandescent Electric Lighting.

OUR APPARATUS
IS OF THE
Highest Efficiency
MECHANICALLY
AND
ELECTRICALLY.



TRANSFORMERS
AND
DYNAMOS
Warranted for Two Years
AND
Satisfactory Performance of Apparatus Guaranteed.

General Offices and Works, EAU CLAIRE, WIS., U. S. A.

AGENTS WANTED FOR EASTERN AND SOUTHERN STATES. CORRESPONDENCE SOLICITED.

BAKER BALCH & CO., General Agents, Seattle, Washington.
LITTLE, McDONALD & CO., 293 Court Street, Buffalo, N. Y.
THOS. WOLFE, Southwestern Agent, Union Depot Hotel, Kansas City, Mo.
P. H. POLGLASE, General Agent, 205 North Seventeenth Street, Omaha, Neb.

THE BEST
Disque Leclanché Batteries
ARE THOSE MADE BY
J. H. BUNNELL & CO.

OVER 200,000 USED IN THE PAST FOUR YEARS. ALL GIVING ENTIRE SATISFACTION.

ASK ANY ONE OF THE MANY USERS OF THE SAME.

THE REASON WHY, is simply because our processes are the most perfect and our materials used in the manufacture are the very best selections that can be obtained.

PRICES ALMOST, BUT NOT QUITE AS LOW AS THE RULING PRICES FOR INFERIOR MAKE.

Porous Cups, 35 cents, Subject to Discount in Quantity.

ONE OF MANY: "WE ARE USING ABOUT 6,000 CELLS OF BATTERY ON OUR CIRCUITS, AND HAVE AS YET FOUND NOTHING EQUAL TO J. H. BUNNELL & CO.'S DISQUE LECLANCHE BATTERY. Yours, Resp'y, GEO. W. ADAMS, Supt., The Boston Electric Association."

J. H. BUNNELL & CO.,
76 Cortlandt Street, NEW YORK.
Send for our Latest Catalogue No. 6, of January, 1888.

The National Feed-Water Heater.

Over 300,000 Horse Power in use in the United States.

200 ELECTRIC LIGHT STATIONS SUPPLIED.

PRICES LOW. SATISFACTION UNIVERSAL.

Seventeen sizes Manufactured, 8 to 2,000 Horse Power Capacity. Heats the Water for the Boilers up to 206° to 212° F.

SEND FOR LIST OF USERS AND EXAMINE FOR YOURSELF.

THE NATIONAL PIPE BENDING CO.,
84 River Street, New Haven, Conn.

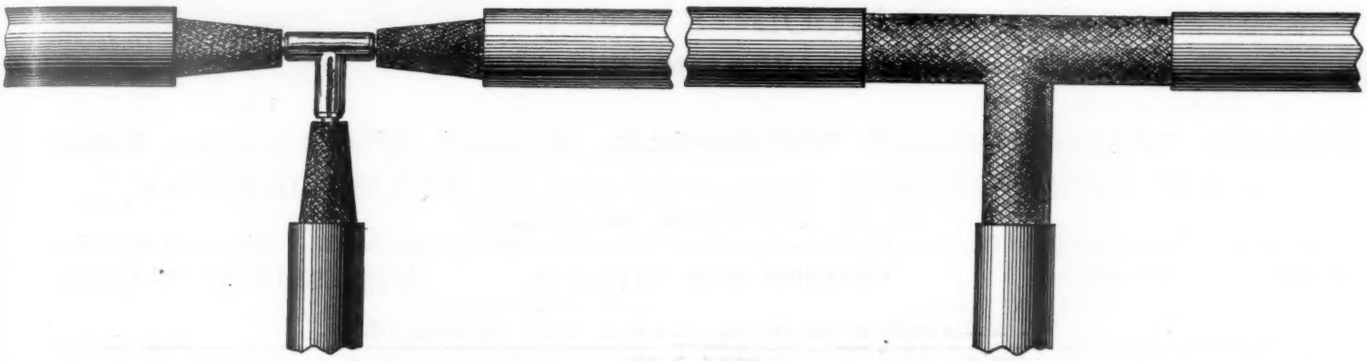
SEELY'S

PATENT

BEVELED EDGE CONNECTOR

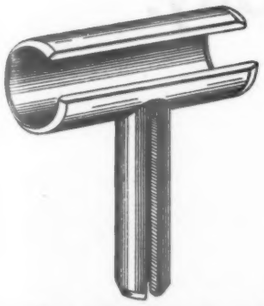
FOR

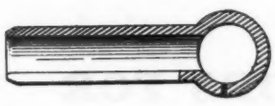
Underground, Aerial and General Electric Light Circuits.



USED FOR ALL UNDERGROUND WORK IN NEW YORK CITY.

MADE TO FIT ANY SIZE OF WIRE.





SEELY MANUFACTURING CO.

No. 14 CORTLANDT STREET,

NEW YORK CITY.

JAMES A. TAYLOR,
Secretary and Treasurer.

JOHN A. SEELY,
Prest. and Gen. Manager.

Fort Wayne Electric Company,

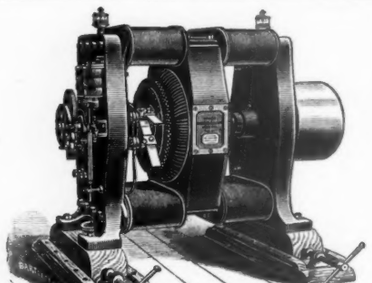
FORT WAYNE, IND.

The most carefully worked out and Complete Alternating System of Electric Lighting in existence.

ARMATURES AND CONVERTERS GUARANTEED.

12 16-candle-power Lamps to the mechanical horse power guaranteed

CORRESPONDENCE SOLICITED.



WOOD DYNAMO.

MANUFACTURERS

—OF THE—

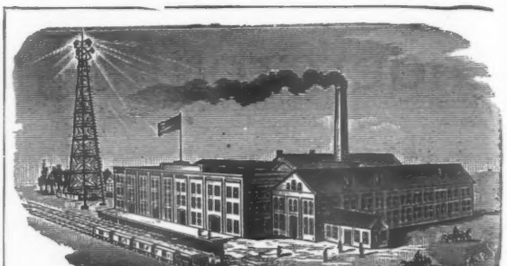
Slattery Induction System

OF INCANDESCENT LIGHTING,

—AND THE—

"WOOD" SYSTEM

OF ARC LIGHTING.



Main Office and Works, Fort Wayne, Ind.

NEW YORK OFFICE, Rooms 25 and 27, 115 BROADWAY,

H. C. ADAMS, Manager.

Manhattan Electric Light Co., 511 Broadway, Sole Licensees and Agents for N. Y. City and Brooklyn

CHICAGO OFFICE, 185 Dearborn St., *W. J. BUCKLEY, Manager.*

PHILADELPHIA OFFICE, 907 Filbert St., *G. A. WILBUR, Manager.*

SAN FRANCISCO OFFICE, 217 Sansome St.

F. ADAMS SUC'S, CITY OF MEXICO.

THE

TUCKER ELECTRICAL CONSTRUCTION CO.

14-20 Whitehall St., New York City.

* * * * * * * * * * * * * *

CONTRACTORS FOR

HIGH GRADE CONSTRUCTION WORK.

* * * * * * * * * * * * * *

Correspondence of Electric Light Companies Solicited.

Refer to some of the Most Prominent Buildings in New York City.